

ARCH

Homemade "B" Eliminator—Page 473

25 CENTS

FEB 7 1928

POPULAR MECHANICS

PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH.

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. TRADE MARK GREAT BRITAIN No. 40248

REG. U. S. PAT. OFF.



SEE PAGE 384

M. G. BUNO/ACH

ATKINS SILVER STEEL SAWS



Cut
Six
Times
More
Metal

Mr. Happy
Man Says

"Get
Them at

Your Hardware Store"

No matter what kind of metal you want to cut, you can do the work faster, easier and better, if you use ATKINS "Silver Steel" Hand Hack Saw Blades.

These wonderful new blades will cut *twice* as fast, and last at least *six* times as long as any other hack saw blade you ever used. Think what a big saving of time, work and money this means to you, on every metal cutting job.

YOUR Hardware Store can show you these new Hack Saw Blades, displayed as shown above. Look for the ATKINS name on every blade you buy, and accept no substitute. We will gladly send folders on "Silver Steel" Hack Saw Blades for hand or power use.

If your dealer cannot supply you, tell us what kind of metal you are cutting, enclosing 25c, and we will send you a sample "SILVER STEEL" blade.



E. C. ATKINS & CO., Est. 1857, 426 So. Ills. St., Indianapolis, Ind.
Leading Manufacturers of Highest Grade Saws for Every Use; Saw Tools, Saw
Specialties, Plastering Trowels, Machine Knives, Grinding Wheels and Files.



Popular Mechanics Magazine

200 E. Ontario Street, Chicago, U. S. A.

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

London: Hachette & Co.,
16-17 King William Street, Charing Cross, W. C. 2

Paris: Hachette & Co.,
111 Rue Reaumur

Melbourne: Gordon & Gotch
509-513 Little Collins St.

ISSUED MONTHLY

SUBSCRIPTION:

SINGLE COPY, 25 CENTS

In United States and its possessions, also Canada, Cuba, and Mexico, per year, postpaid - \$2.50

To all other countries in the Postal Union - 3.00

All subscriptions are discontinued at expiration. Please examine the date printed on your wrapper.

Entered as Second Class Matter Sept. 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3rd, 1879.

Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

Copyright, 1928, by Popular Mechanics Co.

Copyright in Australia. Copyright in France

Vol. 49

Contents for March, 1928

No. 3

Special Features

Risks Men Face in Submarines	353
Mystery of Port of Missing Planes Solved?	360
Babe Ruth's Homerun Secrets	371
The Modern Alchemists	378
The Latest in Furniture	387
Two Pounds Less Than an Elephant	402
True Stories of the Man Hunters	418
On the Trail of Hidden Treasures	434
The Nation's Greatest Ships	443
Right This Way Gentlemen	451
The World's Deepest Mine	467
You Can Build This B-Eliminator for Fifteen Dollars	473

Advertising	
artistic displays made from paint and tin	449
moving sign at rear of auto	377
Airplanes	
flying hospital plane carries loaded auto	384
giant air liners equipped with diners	356
high-speed midget	459
Airship—monster German for transatlantic flight	428
Amusement Park—joy riders drive own cars on twister	397
Apples—for display have stenciled designs	439
Architecture	
church in form of big tower	377
latest style in German theater	459
transforming unsightly hills into home sites	398
Army, Japanese—drilled to use latest weapons	410
Astronomy	
study aided by adjustable chart of stars	466
three billion stars pictured with large telescope	428
Automobiles	
foot power replaces motor in tiny Paris car	471
home and store on wheels aids candy dealer	368
home on wheels is armored	469
Automobiles—Accessories	
back rest saves driver's clothing	366
dial indicates car performance	395
gasoline meter helps save fuel	472
grease extractor prolongs car's life	374
mirror in door visor aids parking	464
sand boxes increase safety	359
shock absorber keeps wheels on ground	448
Automobiles—Equipment and Supplies	
accelerator run by knee	440
folding top increases comfort	457
Automobiles—Fuel—testing exhaust gas helps save	409
Automobiles—Repairing—rollers to iron out fenders	416
Automobiles—Tires	
pinch tells pressure without touching valve	401
rubber bulb in valve tester shows if air leaks	383
Automobile Truck—that piles wood saves hand labor	450
Aviation	
drydock for flying boats	375
fuel gas for motors to make flying safer	433
sound of plane lights lamps on landing field	412
Bed—for invalids folds into chair	375
Boats and Boating	
fish tail on boat promises greater speed	408
rubber, for motorcycle is army aid	401
water sleds with balloon tubes insure safety	429
Bottle, Nursing—holder for, prevents breakage	396
Bottle Filler—saves time and prevents spilling	471
Bridge—bascule, is engineering feat	461
Cable—automatic oiler prolongs life of	461
Camera—in handbag	439
Candle—wooden has reservoir that supplies oil to wick	417
Cathedral—symbolic carvings for national	394
Cattle—milk shed towed to cows to keep herd in open	432
Checkers—"four-in-row" game	401
Corks—expanding, fit different size bottles	414
Crime—invisible eye is latest terror to crooks	458
Delivery, Milk—motor unit for wagons cuts cost	365
Diving—portable suit carries its own air supply	422
Draftsmen's Supplies—adjustable drawing board	448
Electric Iron—three-heat, helps save current	386
Electric Lights	
moving letters tell latest news	470
shield for plugs prevents frayed wires	397
Electric Power—half million volt insulator	466
Explosions—danger of, curbed by mineral-dust sprayer	425
Filter, Water—self-cleaning for the home	386
Fire Extinguisher—control button saves liquid	366
Fire Fighting—battling three year peat fire in snowshoes	417
Furnace	
dustless ash pit helps save coal	409
fitted with fan affords better heat and ventilation	416
vacuum cleaner for, saves coal and dirt	358
Gasoline Nozzle—has valve to prevent dripping	423
Goats—hunting wild from airplane	433
Gold Mining—the world's deepest mine	467

[Continued on Page 4]

Golf	clock to keep scores	464
	mountain as tee permits long drive	364
Grand Opera—voice tester shows singer's suitability for stage		399
History—early, recalled by floodlight on old landmark		422
Homesteads—the race for free land		413
Horse Racing—stalls for starting horses insures better		368
Household Devices		462
House Plan		528
Insects		
	on crops killed by cold-steam process	431
	preserved in metal	366
Inventions—new, from England's patent show		430
Life Saving		
	pistol shoots line to wrecked ship	386
	suit has pockets for food and water	469
Lightning—rubber conductors guard dynamite		447
Logs—as uniforms in novel parade		457
Magnetism—increases vitality and stimulates plant and animal life		432
Map Making—Starting point on Kansas farm		368
Mat, Rubber—helps prevent housewife's fatigue		472
Mending—socks with vulcanizing		369
Mirages, Palace of—produces strange illusions		385
Moving Pictures—color attachment rests eyes		461
Musical Instruments—big horn like a harmonica		400
Muakrats—save fish in northern hatchery		471
Niagara Falls—engineers seeking way to save		465
Oils—blending calculator eliminates guesswork		448
Opera Glasses—fold flat to fit vest pocket		447
Oxen—supplant engines for switching cars		415
Pen, Electric—to burn designs is aid in decorating		441
Playground—on store roof aids women shoppers		369
Plow		
	with revolving shares thoroughly stirs soil	423
	with rotary pulverizer saves farm work	416
Pop Corn—electric popper operates at table		470
Radio		
	experimenter's telegraph key	483
	steel mast easily erected	488
Radio—Aerials—picture frame antenna		482
Radio—Applications		
	amplifier helps deaf in learning speech	383
	doctor answers door in bed	459
	faces produce different sounds	439
Radio—Batteries		
	adding distilled water	483
	charging switch for wet B	488
	filling storage B	487
	non-corrosive connection	476
	safety clips	480
Radio—Broadcasting—of opera helped by mixing panel		366
Radio—Condensers		
	designed for mounting on socket	487
	ground-rotor type eliminate body capacity	481
	midget easy to make	476
	sliding, has many advantages	485
Radio—Construction—drill made from auto horn motor		484
Radio—Eliminator—resistors with mounting to prevent sag		487
Radio—Installation		
	gas pipe a poor ground	485
	of speaker jacks on subpanel	488
	wiring set without solder	481
Radio—Loud Speakers		
	combined with light fixture	481
	using leads as aerial	482
Radio—Pictorial		486
Radio—Receiver		
	adapter makes short-wave set of standard	477
	bringing old audio amplifier up to date	483
	drum dials feature new nine-in-line	485
Radio—Transformers—plug into standard sockets		481
Radio—Tubes—one does work of three		487
Radium—sentries guard mine in Africa		399
Railroads		
	high-speed steam car has hidden boiler	425
	Hudson bay road will end at Churchill	450
	model, aid instruction of trainmen	464
	trains as political posters spread Russian ideas	450
	travel in Australia aided with uniform gauge	396
Reduction—eating most food in morning aids		456
"Rogues" Gallery—for students simplifies college files		393
Rose Tournament—living picture-puzzle map features		359
Safety Devices and Measures		
	chorus of sirens on engines to reduce accidents	365
	men risk lives in bank vault to test oxygen unit	358
Sawdust—has many uses		459
School, Dairy—canvas "cows" aid in milking lessons		399
Screwdriver—holds screw while starting it		396
Ships—blisters on dreadnaughts to absorb shocks		395

Signs—double-glass prismatic show letters clearly	465	
Slot Machine—distributes cigarets and matches	415	
Smallpox—red walls urged for patients	416	
Smokers' Accessories—rubber bulb breaks-in pipe	400	
Soda Dispenser—coin-in-slot, serves drinks quickly	440	
Spark Plugs—pressure test shows up defects	374	
Statue—three-ton hoisted on dome	393	
Stretcher—equipped with springs for moving invalids	429	
Sun—heats water for home	411	
Telegraph Poles—tripods for, resist frost action	429	
Telephone		
	carrier, restores flood-broken service	400
	on infant's crib reduces mother's worry	447
Telescope—vest pocket set helps hunter and hiker	412	
Tennis—"silent partner" helps develop skill	407	
Theater		
	darkness created by light	432
	stage effects with luminous paint	392
Traffic		
	congestion relieved by auto road through building	411
	guided by lamps controlled by auto horn	385
Trees, Cedar—road runs through huge ancient stump	472	
Tribal Ceremonies—long-nosed mask features initiations	431	
Umbrella—with kinked stick helps shelter two	425	
Vacuum Cleaner—sands and waxes floor	364	
Volcano—queer island seen as continent in the making	441	
Warfare—France builds "tank of the air" for night bombing raids	426	
Wheelbarrow—easy-to-empty, needs no blocking	415	
Wigs—ancient art of making adds to opera lure	376	

AMATEUR MECHANICS

Artist's Supplies—homemade academy board	508
Automobiles—Accessories—heater for Ford sedan	502
Automobiles—Repairing—improved long-handed jack	493
Clothesline—to prevent blowing against trees	502
Fireplace—how to remedy smoking	504
Fish and Fishing—automatic indicator for set lines on the ice	508
Heater, Gas—electrifying	503
Household Devices—utility cart for housewives	489
Ice—harvesting with old auto	504
Mandolin—finger grip on pick	506
Photograph—novel albums	505
Photography—photographing objects through magnifying glass	506
Saddle—safe stirrups	493
Ship Model—Flying Cloud	494
Thermos Bottle—made easy to hold	505
Toys—simple merry-go-round	507

SHOP NOTES

Automobiles—Repairing—removing roller bearings on Fords	513	
Automobiles—Tires—how to care for balloon	520	
Bucket—non-overflow	527	
Burglar Alarm—for shop window	522	
Circles—scribing with a rule	519	
Dividers—stretching the point	512	
Drilling—improved depth gauge	522	
Electric Coil—reversing coil points aids spark	511	
Filling Station—novel seat for	526	
Furnace—an automatic boiler man	509	
Garage Equipment—tongs for removing auto motor	519	
Gasoline—guard for tank filling pipe	523	
Goggles—electric fan helps sell	521	
Loading and Unloading—chute for parcels	523	
Logs—metal cone facilitates hauling	512	
Lubrication—grease nipples for large grease cups	526	
Oil—crankcase, can be burned in stove	526	
Paints and Painting		
	color holders for decorators	527
	scaffold for	527
Piano—dolly facilitates moving	524	
Pipe Fitting—tin foil for packing glands	518	
Rims, Tire—make handy foundry flask	511	
Safety Devices and Measures—striped suits protect highway workmen	514	
Screwdriver—attachment holds screws securely	524	
Tin Cans—devices made from	515	
Tools, Parting—automatic chamfering attachment	525	
Vise		
	keyhole-saw	519
	two used for press work	513
Wagon—noiseless, easy riding	525	
Wheel—repair for broken spoke tenon	519	
Wheelbarrow—fender for	514	
Wrench, Chuck—improved	511	

Radio is

pa

L

IN DRY
up of
than of
wasted,
matter
group
ways v
them.
filled
substanc
ment a
ment a
connec
In
"B" H
no wa



Radio is better with **Battery Power**

**Why
pay for waste
space ?**

**Buy the
EVEREADY
LAYERBILT**

- it's every inch a battery



This is the Eveready Layerbilt, the unique "B" battery that contains no waste spaces or materials between the cells; the longest lasting of all Evereadys.

IN DRY cell "B" batteries made up of cylindrical cells more than one-third of the space is wasted. That's inevitable. No matter how closely you pack a group of cylinders, there always will be spaces between them. Usually these spaces are filled in with pitch or other substances, to prevent movement of the cells during shipment and breakage of the wires connecting cell to cell.

In the Eveready Layerbilt "B" Battery No. 486 there are no waste spaces between the

cells and no useless materials. Instead of cylindrical cells, this extraordinary battery uses flat cells. It is built in layers and assembled under pressure into a solid block. Electrical connection between cell and cell is automatic, by pressure of the entire side of each cell against its neighbor.

The most surprising thing about this construction is that it actually makes the active materials more efficient. A given weight of them produces more current, and lasts longer, than the same amount when put in the cylindrical cell form. This was the unexpected result of researches into methods of utilizing the hitherto waste spaces. Scientists now know that the flat shape is the most efficient form for the cells in a "B" battery. No wonder the Eveready

Layerbilt is the most convenient and economical of all the Evereadys.

Only Eveready makes the Eveready Layerbilt. Its exclusive, patented construction is Eveready's greatest contribution to radio enjoyment, giving new economy and convenience to battery users. The Eveready Layerbilt, of course, provides Battery Power—silent, reliable, independent, guarantor of the best reception of which your receiver is capable.

NATIONAL CARBON CO., INC.

New York **UCC** San Francisco

Unit of
Union Carbide and Carbon Corporation

Tuesday night is Eveready Hour Night

East of the Rockies
9 P. M., Eastern Standard Time
Through WEAF and associated N. B. C. stations

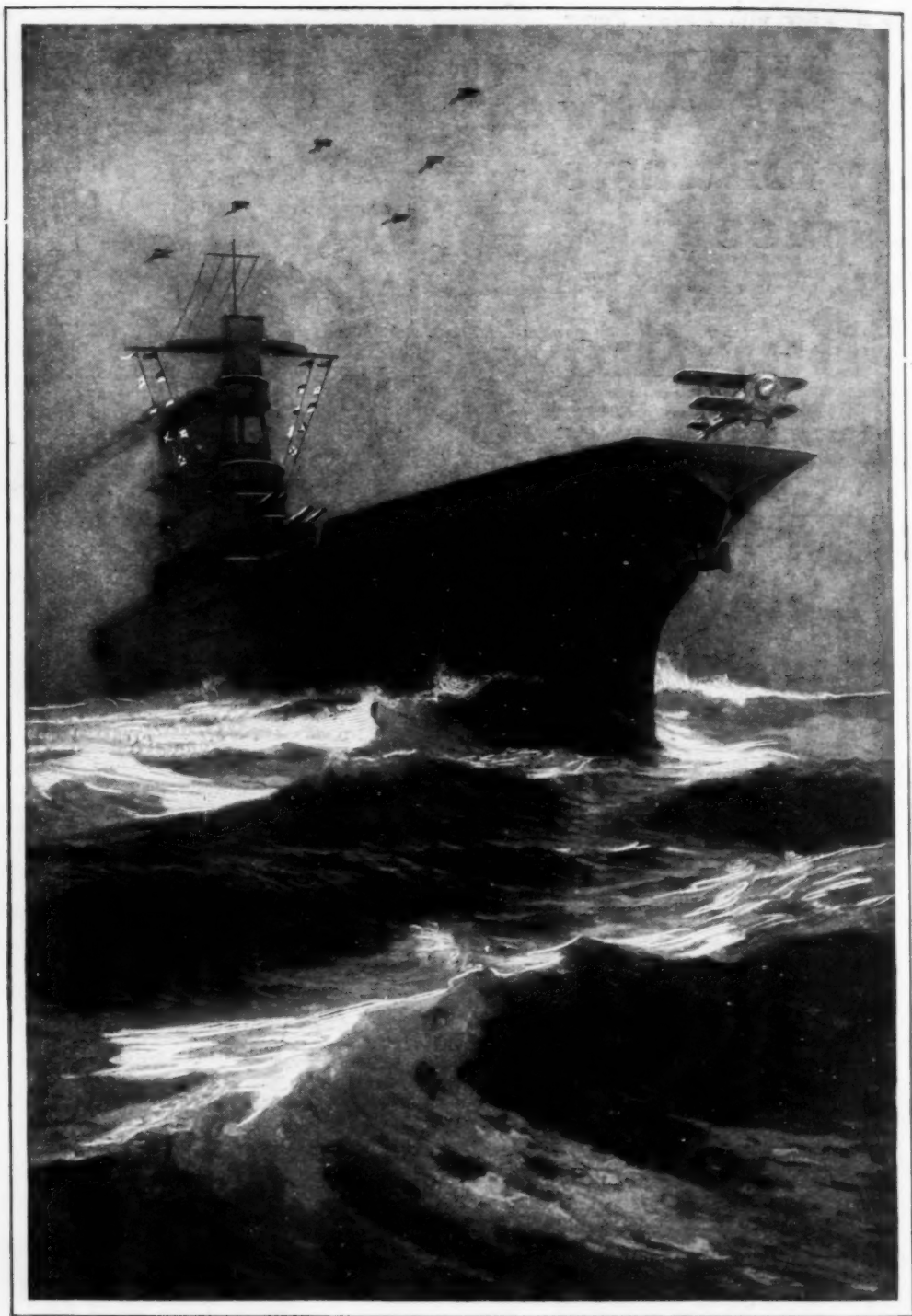
On the Pacific Coast
8 P. M., Pacific Standard Time
Through N. B. C. Pacific Coast network

EVEREADY
Radio Batteries
-they last longer



Illustrated to the left is the cylindrical cell type of "B" battery construction. Note the waste space between the cells.

The air is full of things you shouldn't miss



Courtesy General Electric Co.

As the "Saratoga" Will Appear in Actual Service; Artist's Conception of the Huge Carrier at Sea with Plane Taking Off; Only the Turret Guns Suggest a Battleship—See Page 443

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

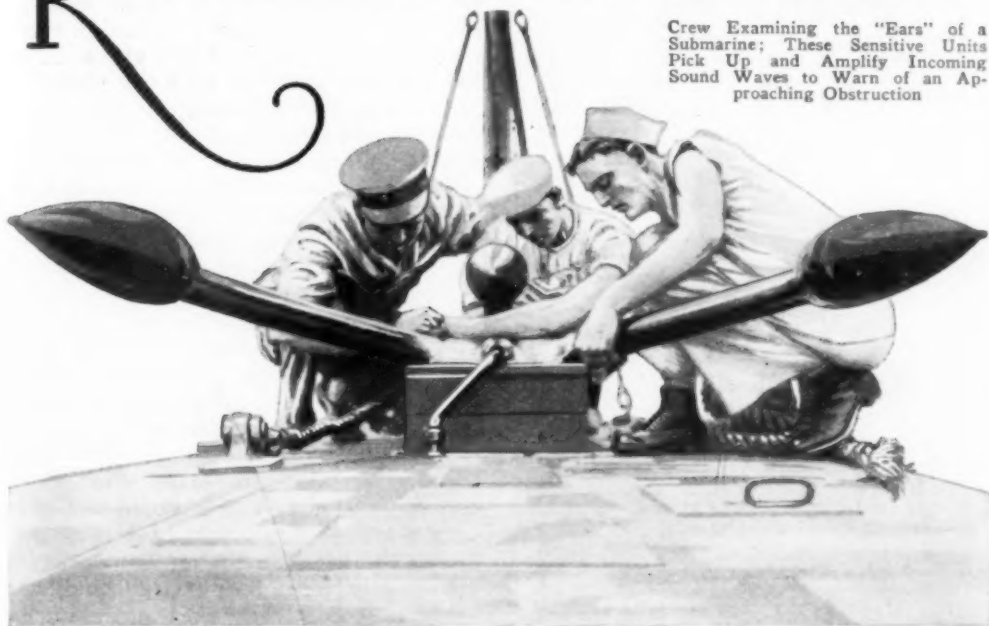
Vol. 49

MARCH, 1928

No. 3

Risks Men Face in "Subs"

Crew Examining the "Ears" of a Submarine; These Sensitive Units Pick Up and Amplify Incoming Sound Waves to Warn of an Approaching Obstruction



THE terrible loss of life in submarine disasters has brought home to designers the necessity of providing some means of escape for men imprisoned in them.

Many ideas have been suggested, but have been discarded because, if each were installed, the activity of the craft would be so hampered as to render it almost useless.

If the point at which damage might occur were known, it would be easy to invent a means of aid, but such points are almost without limit. For instance, a collision might injure the hull in the vicinity of a lifting eye, thus weakening it, or in the middle, causing it to buckle in raising.

The genius of man has given the undersea boats an uncanny cunning. Almost literally, a submarine can see, feel, hear and talk. It might well be called the

masterpiece of the mechanics' art—so much so, in fact, that the greatest element of peril to a submarine lies outside its hull, not within it. That is why the majority of fatal accidents to American undersea boats have been from collision. Three out of five major catastrophes have been of this nature.

"The 'S-4' was equipped with all the latest safety and escape devices," declared Comm. A. G. Dibrell, of the navy, "yet it sank. It is difficult to understand, before the raising of the 'S-4,' how she could have been ignorant of the position of the ship that rammed her. Even without the listening apparatus, it is quite easy to hear the noise of a propeller through the hull itself. Listening devices of the type used on the 'S-4' are extremely accurate and



Composite Photo Diagram to Show How Divers Communicated with Men Imprisoned in the "S-4"; the Hammer Signals Were Answered for Several Hours before Final Silence

sensitive. Why, we even have target practice, submerged, using nothing but the listening device to locate the target.

"It is rather obvious that something went wrong, mechanically, on the 'S-4,' and forced her to the surface despite the greatest efforts of her crew. I have had just that experience myself, but fortunately no surface vessel was near.

"Because of the very nature of accidents to submarines the crews usually perish instantly. But in order to enable any possible survivors of an accident to escape, hatches now are provided in every chamber of a boat with the exception of the battery room. In that one place the presence of even a minute quantity of salt water would generate deadly chlorine gas and kill the entire crew. In the compartment where men were known to have been alive on the 'S-4' there was an escape hatch. But it would have been suicide for any man to have used it at the 100-foot depth to which she sank.

"Those hatches are operated by air pressure. At that depth the water pressure was approximately forty-four pounds to a square inch, so high that it would take a jack capable of lifting ten tons to move one. If a man, operating the escape hatch, were able to stand the necessary air pressure—and it could not have been produced—he would have been shot out of the hatch in the air bubble like a bullet. His rise to the surface would have been so rapid that the instantaneous change in pressure would have killed him."

Lieut. Comm. George Dickson, retired, who designed submarines for the navy, and who was in command of submersibles for eight years, plans to offer a suggestion to the navy department as a result of the "S-4" accident.

"Of course, the 'S-4' should have known that the destroyer which rammed her was close by before she rose," he explained. "The sound of that boat's propeller should have been perfectly audible to all on board. Something went wrong somewhere, but in such an emergency, if the commander of the ship could have notified surface boats that he had to come up, the accident might have been avoided. I think that such a warning might be given by use of a special tank that could be filled with colored water. That tank might be an

integral part of the hull, and could be blown empty by compressed air with such force that it would send up a huge column into the air, just as a whale spouts when coming to the surface. In all likelihood some one on board an approaching surface vessel would see such a signal."

Another suggestion, which has not yet been tried out, calls for the use of a rescue submarine carrying a hollow tube that could be pressed against the side of a disabled craft. After the water had been pumped out, a man might crawl through with a torch and cut a hole in the side that would enable the crew to escape.

Rear Admiral G. H. Rock, assistant chief of the bureau of construction and repair, rejects the idea of life chambers, saying:

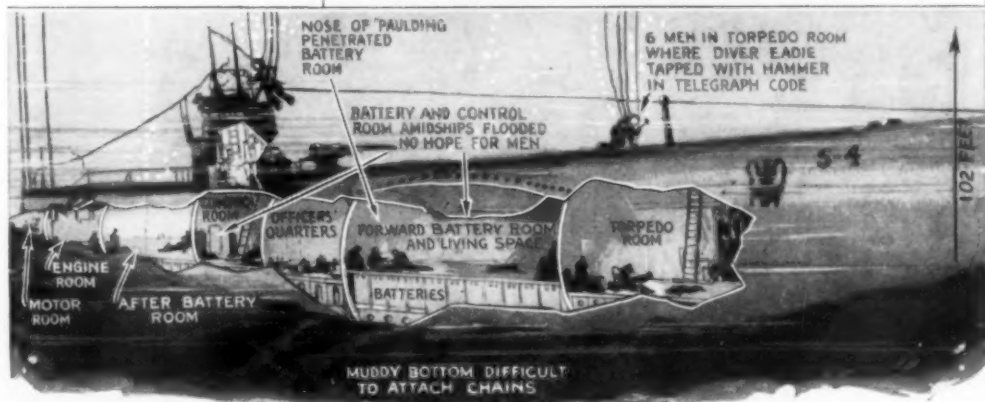
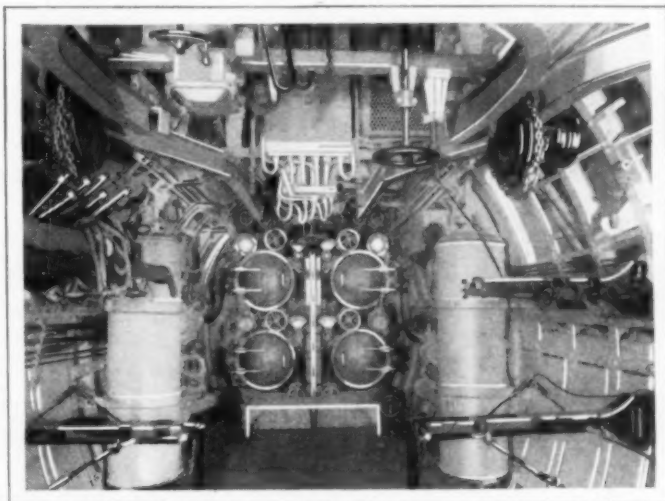
"A chamber large enough to hold the crew of a submarine would necessitate an unduly large structure on deck, or else an undue restriction inside the submarine. The deck structure would be objectionable from the point of view of submerged resistance and weight. It would detract too much from the military value of the vessel and there could be no assurance that the opening through which access to such a lifeboat could be had, might not be flooded."

Rear Admiral Rock also frowns upon the use of marker buoys for indicating the position of a sunken submarine, because no such buoy ever has been devised which cannot be accidentally released. Drop keels for the purpose of lightening a sinking vessel have been used but do not meet the navy's approval.

So far as raising sunken submarines is concerned, Admiral Rock believes the pontoon system, aided by derrick hoists, is the only practicable one.

Summing up the efforts and aims of the bureau in preventing accidents, and in rescue work, he says:

"Safety must come through improvements in the internal construction rather than by the provision of additional rescue or external apparatus."



Upper Photo © Henry Miller

Upper Photo, View of After End of Torpedo Room on the "S-4" with Tubes in the Background; Below, Artist's Drawing of the Sub as It Probably Lay on Bottom, and Divers at Work

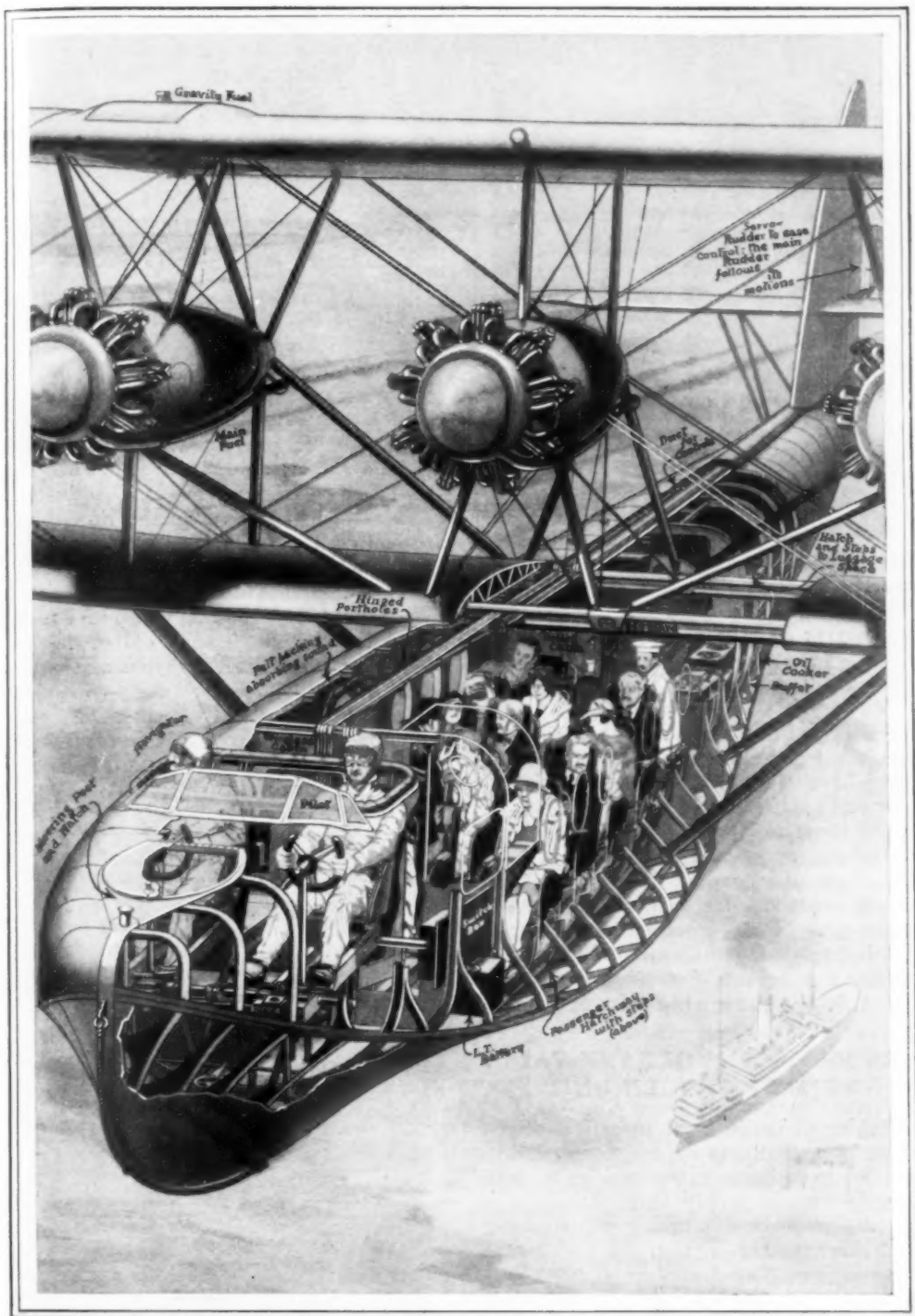
GIANT LINERS OF THE AIR EQUIPPED WITH DINERS



Passengers Who Ride on Air Cushions in New British Liners Can Wear the Seats as Life Preservers; at Left, Food Tray on Back of Seat; Other Views, the Life-Preserver Cushions

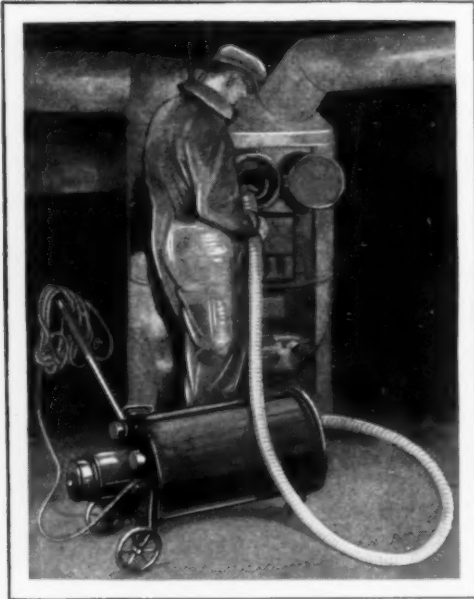
New air liners built for the British Imperial airways service from London to India will carry cook-stewards to prepare and serve meals en route. The new planes, giant three-motored flying boats, have all the latest flying conveniences, and are equipped to land on the sea, if necessary. They are to be used on the final stages of the England to India route, crossing Persia and the sea. The flying boats are of all-metal construction with a wing span of ninety-three feet and weigh nine tons loaded. They have seats for fifteen passengers in a roomy cabin and carry a crew of three, including the pilot and a relief pilot, who will take turns at the controls and supervise the navigation, and the cook-steward. Each seat is fitted, on its back, with a folding table tray that can

be raised to serve the passenger in the next seat to the rear. The passengers will ride on air and lean back against air, for both seat cushions are of rubber, inflated. They are so arranged that in case of an emergency landing at sea, the passenger can rise, don his seat cushions and be fully equipped with a life preserver. The flying boats have a speed of 120 miles an hour with their three engines, totaling 1,500 horsepower, and carry enough gasoline to make 760 miles at cruising speed. The London to India airline is the first big link in Great Britain's projected air service to Australia. Because of the enormous distances covered, the weeks consumed in steamer passages, and the fact that much of the route is over land, the service is expected to pay from the start.



© S. W. Clatworthy

Passenger Accommodations in New Three-Engine Air Liners Built for the London-to-India Service; the Hulls Are Stanchly Built Boats, Capable of Landing and Navigating in Rough Seas; a Steward Is Carried to Serve Meals While in the Air



Removing Soot from the Furnace by Suction; Applying Vacuum Cleaner Which Eliminates Dust

VACUUM CLEANER FOR FURNACE SAVES COAL AND DIRT

Much of the unpleasant labor and spreading of dirt attendant upon the task of cleaning the furnace has been eliminated by a vacuum outfit which sucks the soot and rust from pipes and flues and deposits them in a bag, just as the home-cleaning vacuum machine does with the dust from the carpets. The unit is designed especially for furnace service and repair men, works from a lighting socket and is easily moved about on wheels. It weighs but seventy-five pounds and has attachments to scour the furnace interior.

MEN RISK LIVES IN BANK VAULT TO TEST OXYGEN UNIT

Staking their lives on the effectiveness of an oxygen-supply apparatus to prevent persons from being suffocated when accidentally imprisoned in vaults, three men recently spent twelve hours in a cramped, air-tight chamber to test the equipment. They emerged, evidently none the worse for their experience, and examination showed that the air within the vault had undergone negligible changes. The men consumed about \$2 worth of oxygen dur-

ing the experiment. The gas was supplied from a cylinder equipped with a regulator to allow the oxygen to be released in varying quantities, depending upon the number of persons in the vault, and a special chemical was applied to the floor to absorb harmful gases given off in breathing.

RARE BIRD'S QUEER "TALKING" PUZZLES SCIENTISTS

A bird, smaller than a canary, with a vocabulary of at least 300 recorded words, with more being added constantly, was exhibited recently before the American Psychological association at Columbia university. The bird, a variety of the African finch, proves, according to Dr. William Morrison Patterson, who has spent two years studying it, that instead of merely singing to pass the time, birds are really talking. Dr. Patterson does not claim that the bird speaks a language, or understands what it is talking about, but merely described the 300 voicelike sounds which the tiny finch has used in the last two years. It has an alphabet of twenty-four phonetic vowels and consonant sounds which it uses to form its bird talk. When talked to, it will answer with words of its own, and not by imitating human sounds, as does the parrot.



African Finch That Has Voice Producing Sounds like Those of Human Speech



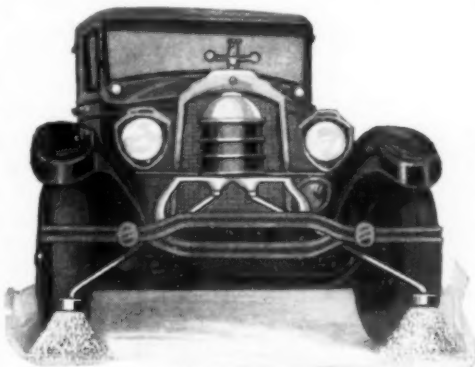
The Living Map Before Assembling: Children Bearing Placards Cut to Represent the Different States; the Cards Were Fitted Together to Form a Huge Map

LIVING PICTURE-PUZZLE MAP FEATURES ROSE SHOW

One of the events at the last tournament of roses in Pasadena, Calif., was the formation of a huge picture-puzzle map of the United States from cut-outs carried by children. The state idea was also observed in the parade, which included a float for each commonwealth, that was preceded by a page bearing the emblem of the state represented.

SAND BOXES FOR BUS OR AUTO TO INCREASE SAFETY

Sand on the rails is a great help to the railroad train and now this aid has been brought to the motorist in a simple way of applying it for greater safety when the streets are slippery. On a touring car, a container is attached to the front of the radiator and the sand poured under the front wheels through two spouts. The flow is regulated from the dash. A similar installation for larger busses or



Sand Box Installed in Front of Auto, Showing the Distributing Pipes Leading to the Wheels

trucks is provided in sand boxes in front of the rear wheels. The dust pours out when a trap is released by the driver.

VOLCANIC DUST FADES THE SKY AND AFFECTS WEATHER

The sky is losing its blue color in some parts of the world, according to Sir Napier Shaw, an English meteorologist, due, he believes, to the presence of chemical or moisture particles forming as a result of some volcanic eruption. There is a marked effect on the climate in some areas, he declares. In 1912, the weather was unusually cold and rainy in many sections, and an eruption of Mount Katmai was accompanied by an average fall of temperature of three-quarters of a degree. In 1903 and 1904, similar changes occurred with the appearance of a whitish sky. Two eruptions of mountains in the West Indies occurred during the period. The scientist has photographs which indicate, he says, the presence of foreign material where there should be clear sky.

Mystery of Port of

By J. EARLE



Plunging Out of the Clouds in Helpless Tailspins, Aviators Have Gone to Death Because of Trust in Their Ears

TWO thousand or more aviators have gone to death, including, probably, several of the missing transatlantic and transpacific flyers, because of a mistaken trust in the little semicircular canals of the ear, which furnish, like two spirit levels, the balancing element for the human body.

That is the conclusion of army air-service officials as the result of discoveries by Capt. William Ocker, oldest flying officer of the army air corps, and Surgeon D. A. Myers, army doctor at Crissy field, San Francisco.

They found that, when an aviator flies into fog and clouds and loses all touch with objects on the earth or in the sky, his ear canals not only cease to function properly, but can actually mislead him so

far as to send him crashing down, out of control, in a deadly tailspin.

Flyers have recognized the menace of "blind flying" from the start, and one of the oldest tests for pilots requires them to stand on one foot with their eyes closed, under which circumstance it is difficult to preserve balance. But that a pilot could be misled with his eyes open and with turn and bank indicators on his instrument board to guide him, is a new discovery.

The circumstances surrounding the loss of only one of the ocean flyers of last summer is known. That was the ill-fated "Dallas Spirit," which set out on a rescue mission to search for the missing Dole flight ships. Several hours later, the wireless brought a cryptic message that the plane had gone into a tailspin. Apparently the ship was brought out of the spin safely, for the operator started sending again, only to interrupt with his final SOS, saying they had gone into a spin again.

Captains Ocker and Myers believe the second spin never happened, that it was an imaginary one, and that, in trying to overcome the delusion into which his ear canals had led him, the pilot put the ship into a spin from which it never recovered.

The reason for the delusion is that the ear canals are misled by the eyes. When a plane turns off its course, the compass card immediately begins to swing to indicate the change of direction. As the pilot brings the ship back to the course, the card swings in the opposite direction, but, because of its free movement, continues to swing past the point, leading the pilot, when he can see neither land nor sky, to believe his plane is still turning. Trying to correct that imaginary turn, according to Ocker's discovery, accounts for the ships that have come plunging from the clouds out of control.

Captain Ocker's investigation of the hallucinations of the inner ear go back to 1919, when he tested the first gyroscopic turn indicator, in co-operation with

Missing Planes Solved?

MILLER

Lawrence Sperry, the inventor. He noted that, when a pilot was flying in clear weather, he could spin and spiral at any speed without danger of vertigo. The inner ear and the eyes co-operated to give the flyer both a feeling and a sighting check on his position in relation to the earth. Perfect balance was possible when only a single star could be sighted through the clouds. One object alone was enough to form a relationship for the guidance of the ear. However, as soon as a pilot began to spin or spiral in a fog, vertigo occurred and often pilots spun out of the clouds and crashed without understanding that their vertigo had caused them to deceive themselves.

The answer, he has found, is to keep the eyes fast on the bank and turn indicators and absolutely ignore the messages of the ear canals. Tried out on subjects seated in a flight testing chair, Capt. Ocker demonstrated that a blindfolded person would insist he was spinning right or left when the chair was perfectly still, and that he was in level flight when actually the chair was spinning violently to one side or the other.

Substituting flying instruments, mounted in a box so the subject could see nothing but the dials before him, and telling him to ignore what his senses told him and be guided only by what the instruments showed, Capt. Ocker demonstrated that it was possible to give an absolutely accurate report on every movement. Without exception the ear messages were delusions, wrong every time.

Lieuts. Maitland and Hegenberger, the army pilots who flew the first ship from the mainland to Hawaii, were taught the Ocker's system before they started, and reported on their return that "it carried us through."

Colonel Lindbergh had not been told of the discovery when he designed his "Spirit of St. Louis," but it is interesting that, out of his experience as a night-mail pilot,



Army Flyer Discovers Simple Lesson with This Outfit Will Teach Any Pilot to Fly Safely in Blackest Fog or Deepest Night

he grouped the instruments on his board in such a way that his bank and turn indicators were right together before his eyes. Many people marveled that he should cross the ocean in a "blind" plane, which required a periscope to even see out of, but the answer was that he flew by instruments and disregarded everything else. Being accustomed to flying the night mail in any kind of weather, he had learned to disregard his ears and trust to the instrument board.

Birds, according to Capt. Ocker, are subject to the same failing. After a foggy night at sea, many birds are found dead along the beaches, where they have crashed to earth while apparently believing they were flying safely.

"In fog or blind flying," Capt. Ocker

Captain Ocker's Test Chair, in Which Pilots Are Revolved, with Feet on "Rudder Bar." While Watching Instruments Supported in Front of Their Eyes



says, "when the 'feel' of the airplane leaves the pilot, there are two distinct hallucinations that all normal pilots are subject to. First, when a plane is turning and then discontinues the turn and flies a straight course, the pilot's senses tell him he is turning in the opposite direction. A glance at the compass apparently confirms this, for the card hasn't come to rest and is swinging in the opposite direction. Secondly, when turning and simultaneously descending—as when spiraling down for a landing—upon straightening out and flying level, the pilot will have the sensation of turning in

the opposite direction and of ascending.

"The dangerous element is that the pilot is convinced by his compass that he is spinning in the opposite direction, so he controls the plane to bring it out of the imaginary spin, and thereby sends it into an actual one."

Anyone can demonstrate the misleading information supplied by the balancing levels in the ears. Standing on one foot with the eyes closed, or while blindfolded, is only one way. Another is to shut the eyes and then turn around in one direction. As soon as you stop, your senses inform you that you are revolving in the opposite direction, and the effect of the ear channels' report is so strong that the body will sway

In the aviation test chair, used in trying out pilots, it is possible to increase the rate at which the body is turning until the movement and the action of the inner-ear mechanism are coincident, when the ears will send the impression to the brain that the movement has ceased and the body is remaining still.

Stopping the movement or retarding the speed at which the chair is turning causes the subject to believe he has begun to turn in the opposite direction. At the same time there is a sensation of falling.

The problem of testing pilots is one that is being constantly studied to improve on old methods and also to locate the defects that have caused fatal accidents to others. "It takes greater skill," says Dr. Donald A. Laird, director of the Colgate psychological laboratory, "and a more perfect constitution to be a safe air pilot than it does to drive an automobile. Good intentions alone will not make a safe pilot. Early in the war the British found that, out of every hundred of their aviators killed, ninety cases were due to physical and psychological defects. Thorough tests were then started, and, three years later, the proportion was reduced to not more than twenty out of a hundred.

"The defects that hamper a pilot, it should be understood, are not ones that would make him a defective for ground pursuits. They are simply traits and conditions which would be a handicap in piloting an airplane, but might not be a handicap in other important occupations."

Even weight, Dr. Laird points out, can be a handicap in flying, partly because planes are not built, as yet, with room for fat people, and partly because every extra pound carried is just so much more load on the motor and limits the height to which a plane can fly.

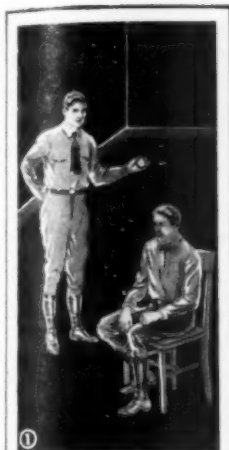
"If you have had rheumatism," he adds, "piloting is apt to be hazardous, because rheumatism usually involves organic heart disease, and this is dangerous at high altitudes where the air contains less oxygen."

"Previous attacks of malaria are also considered as disqualifying because of the recurrence of the attacks due to the cold encountered at the higher altitudes. Hay fever used to be considered a disqualification, but now it appears that it may be benefited by flying. Asthma, however, involves a restriction in breathing which makes it unwise for a person so afflicted to ascend into the air as a pilot."

"The best age for flying seems to be from twenty to twenty-eight. A person may learn to fly after twenty-eight, in fact some flyers have learned at such a ripe old age as sixty or more, but the school of aviation medicine believes no pilot can become a really expert flyer if he starts after his twenty-eighth year. One man with a wooden leg is flying a seaplane, but, in general, stiff joints are a bar to handling the controls. Almost perfect eyes are necessary, co-ordinated with ability to judge distance. An error in judgment of a foot may be enough to wreck a plane in landing. Color blindness is also a drawback, particularly in night flying."

Simple Tests of Flying Faculties: 1. You Should Be Able to Hear a Watch Tick Forty Inches Away; 2. Two People, Facing with Eyes a Foot Apart, Should See a Pencil Tip, Brought In from the Side, at the Same Time, Otherwise One's Field of Vision Is Restricted; 3. Depth Perception, Measured at Distance of Twenty Feet, with One Pencil Held Stationary and the Other Moved Back and Forth, Try to Tell When They Are Same Distance from You, an Error of Eight Inches Being Allowed; 4. 5 and 6. Tests for the Inner-Ear Canals; Screw Piano Stool Up Until Feet Are off Floor, Touch Tester's Finger, as in 4. Shut Eyes and Raise

Hand, Then Lower and Try to Touch Fingers Again; Next Revolve Stool Ten Times in Ten Seconds, as in 6, with Eyes Still Closed, and Repeat Touching Experiment; in 7, with Chin on Chest, the Subject Is Revolved Five Times to the Right in Ten Seconds, Then Told to Hold Head Up; if Ears Are Working Properly He Will Fall toward the Right; Repeat This Test in Opposite Direction



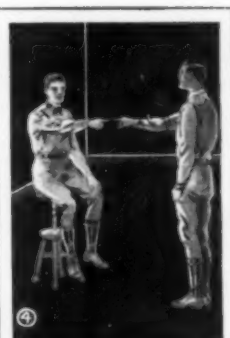
①



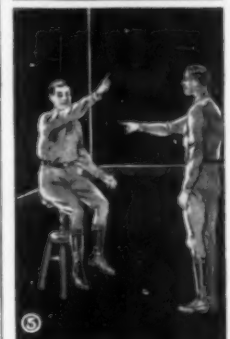
②



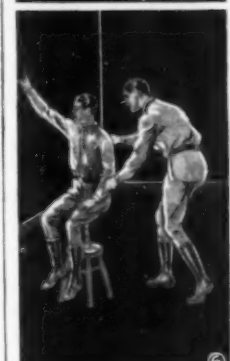
③



④



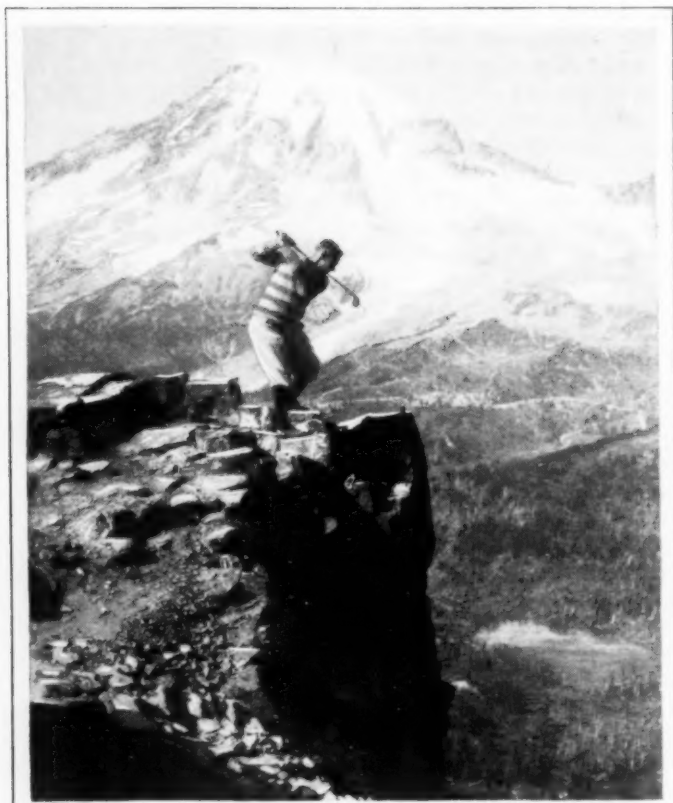
⑤



⑥



⑦



Hazards in Abundance and a Mountain for a Tee; Golfer Making Long Drive from Pinnacle Peak in Rainier National Park

MOUNTAIN USED AS GOLF TEE PERMITS LONG DRIVE

Standing on the tip of Pinnacle peak in the Rainier national park, a golfer recently made a drive of 650 yards from the edge of the cliff. The altitude at that point is over 6,600 feet and it was believed that the thinner air may have helped contribute to the success of the long drive. Wind conditions were also favorable.

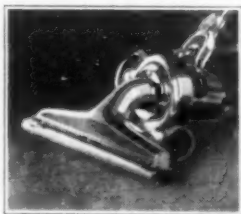
GEMS MADE FROM ALUMINUM RIVAL NATURAL STONES

By the magic touch of chemical processes, aluminum is converted into sapphires and other precious stones. To an aluminum powder, a small quantity of oxide of cobalt is added to give it a blue color. The mixture is then put in a furnace and heated to a temperature of more than 2,000 degrees Fahrenheit. As the

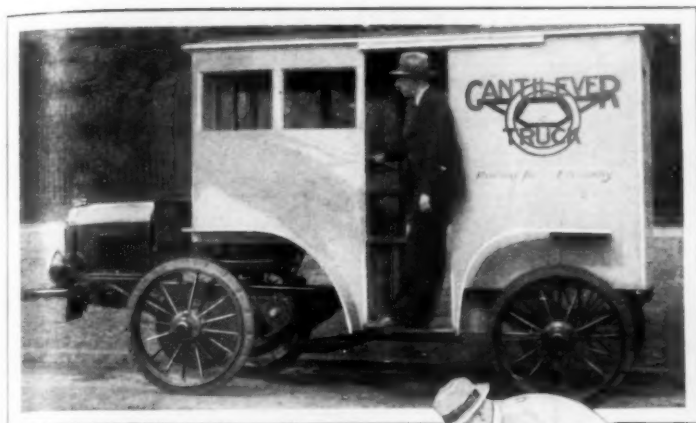
material falls upon the glowing points of blow-pipes giving off an oxyhydrogen flame, it forms molten drops of an exquisite blue shade. These are pure sapphires and, when cool, harden into stones of a quality equaling that of the natural gems. Rubies, amethysts, emeralds and topazes are also made from the metal. The foundation of all these is a special kind of glass known as "paste," harder than the ordinary substance used and containing about fifty per cent oxide of lead. Oxide of copper with oxide of chromium is used in preparing imitation emeralds while gold, tin and antimony are employed in the making of rubies.

VACUUM CLEANER SANDS FLOOR ALSO WAXES

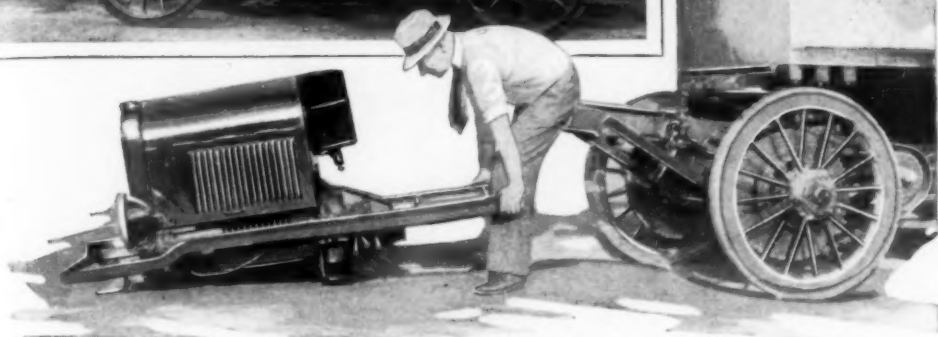
Besides being an efficient suction cleaner, a vacuum now on the market is easily converted into a unit for sanding, waxing and polishing hardwood floors. This is accomplished by the attachment of a special tool to the nozzle. A piece of sandpaper is wrapped about it and the pressure of the cleaner is sufficient to smooth off the rough spots on the floor. The dust and scrapings left from this operation are removed by running the vacuum in the usual way,



then the polisher may be employed in applying the wax, and, finally, in polishing. The unit requires practically no attention as the bearings do not need to be oiled. As with other implements of its type, the vacuum is run by electric current supplied from a house-lighting socket. Its wheeled base permits easy operation.



Milk Wagon Motorized, Showing Driving Method and How Engine Unit Is Easily Detached



MOTOR UNIT FOR MILK WAGONS TO CUT DELIVERY COSTS

Milk wagons of the drop-center type can be quickly motorized by the attachment of a tractor unit which supplies power at a considerable saving over the horse-drawn vehicle, the manufacturers assert. The outfit is also furnished with a specially built wagon. The principal features of the motor are that the driver operates it standing up, it is pivoted to the wagon both vertically and horizontally and is on a two-wheeled chassis so that it embodies the power plant, driving and steering assemblies all in one unit. This arrangement makes for easy starting, stopping and handling the vehicle in traffic. The motor may be removed from the wagon for repairs and another one quickly attached.

In from five to eight hours of continuous operation, the engine consumes about three gallons of gasoline and the maximum speed is fifteen miles an hour.

CHORUS OF SIRENS ON ENGINES TO REDUCE ACCIDENTS

Four siren whistles, operated as a unit and spreading a penetrating note in as many directions, have been attached to locomotives of a western railroad as an improved warning signal. It is believed that the arrangement will prove especially effective at grade crossings, for the whistles can be heard for three miles, the note is lower, and the fact that the noise is spread in all directions, reduces the likelihood that the signal will be shut off by wind currents or obstructions.



Siren Whistles on Engine Operate as One



Back Rest in Use
and Close View of
Its Construction

BACK REST FOR AUTO DRIVERS SAVES WEAR ON CLOTHING

Quickly adjustable to the needs of the user, a back rest for the automobile driver affords an air space between him and the seat cushion for greater comfort, and eliminates practically all friction, so that there is less wear on the clothing. It is easily regulated by means of a simple rod-and-tube arrangement and is of special convenience to persons who need an extension to reach the clutch and brakes.

INSECTS PRESERVED IN METAL BY CHEMICAL PROCESS

Half by accident, a German scientist has discovered a method of preserving insects in copper. The process virtually "petrifies" the specimens and reproduces them in faithful detail. The investigator had undertaken a chemical analysis of some insects and had proceeded to cover them with finely powdered copper oxide. The next step was to heat them in platinum crucibles in an atmosphere of carbon dioxide. At the end of the treatment, the scientist was surprised to find that the outer parts of the insects had been penetrated by the metals so that they were incased in a copper armor on which were reproduced all the delicate markings and other features of the original exterior.

OPERA BROADCASTS HELPED BY MIXING PANEL

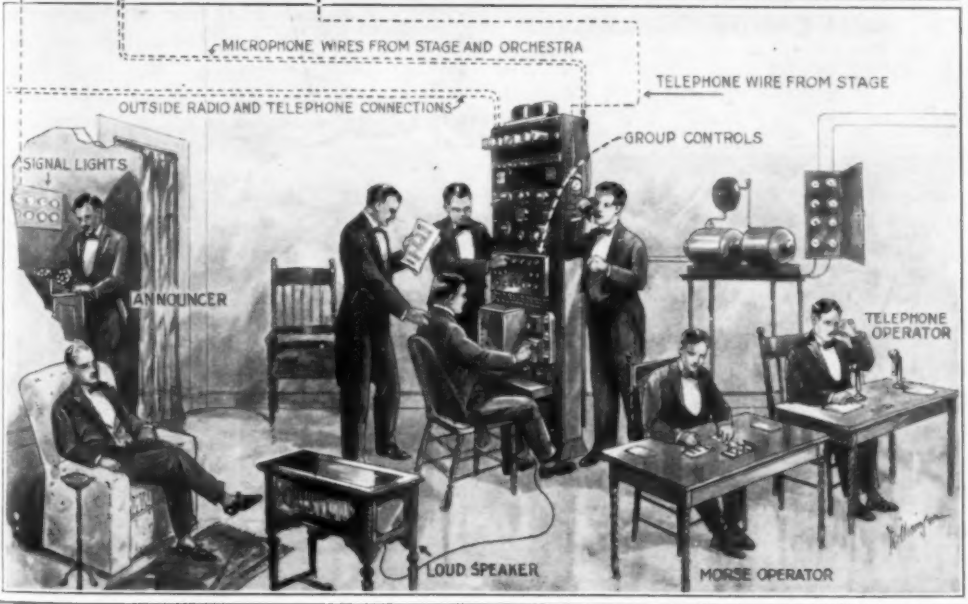
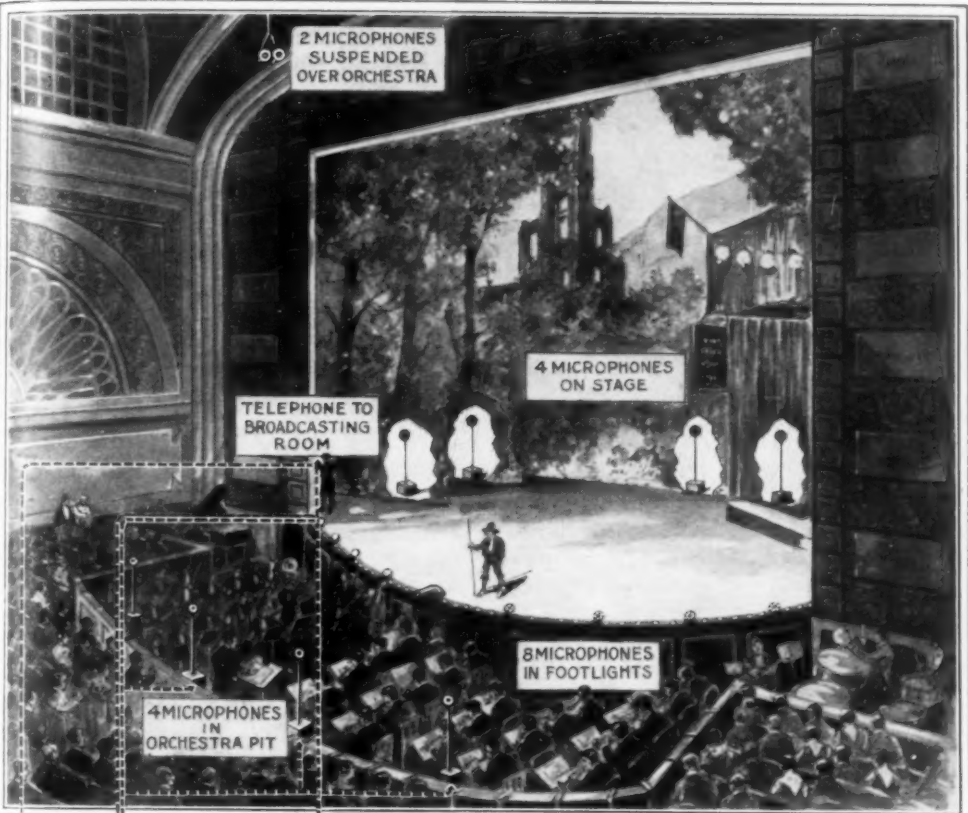
Radio engineers have achieved marked success this year in broadcasting grand opera, one of the most difficult pick-ups in wireless. The improvement is chiefly due to a special mixing panel by which the orchestra music, chorus and solo voices are so blended that a radio listener, miles away, may enjoy the approximate audible equivalent of being in the best seat in the house. The panel was devised to broadcast the Chicago opera. It was designed by Eugene F. Grossman, operating engineer of the National Broadcasting company, who first tested it during the Dempsey-Tunney fight. The panel controls eighteen microphones which are carefully distributed in the orchestra pit, along the footlights and on the stage. During a production, all of them are in the circuit so that it is not necessary to make "cut-ins," and by means of two dials, one for the stage and the other for the orchestra microphones, the operator can successfully balance the output. Besides these controls, there are separate ones for the individual microphones.

CONTROL BUTTON ON "FIRE GUN" SAVES LIQUID

Fire-killing liquid in an extinguisher now on the market is not all expended unless the occasion demands it, as there is a control button at the side to shut off the flow when desired. The remainder may be used again. The unit has no pump, being actuated by pressure created by a gas liberated from a cartridge at the top. To start the extinguisher, a button on the top is struck a sharp blow. This punctures the cartridge, releasing the gas. A stream can be thrown from twenty-five to thirty-five feet and the extinguisher is easily reloaded.



MANY MIKES USED IN BROADCASTING GRAND OPERA



STALLS FOR STARTING HORSES INSURE BETTER RACES

Fewer poor starts in horse races are expected by using stalls at the barrier. They

the fortune they lost as a result of the war. The living quarters include a parlor, bedrooms and kitchen, while in the trailer there is space for an extra bedroom as well as for supplies and provisions. The



To Make the Race Horses Less Restless at the Start; Individual Stalls Are Calculated to Calm Nervous Animals and Insure a Better Get-Away at the Wire

are intended to make restless horses quieter and easier to manage, insure a more even line-up and prevent the actions of one fractious horse from affecting the others as much as often happens with the present method. As installed at Tia Juana, recently, the stalls provided room for sixteen horses with space for three or four more at the outside.

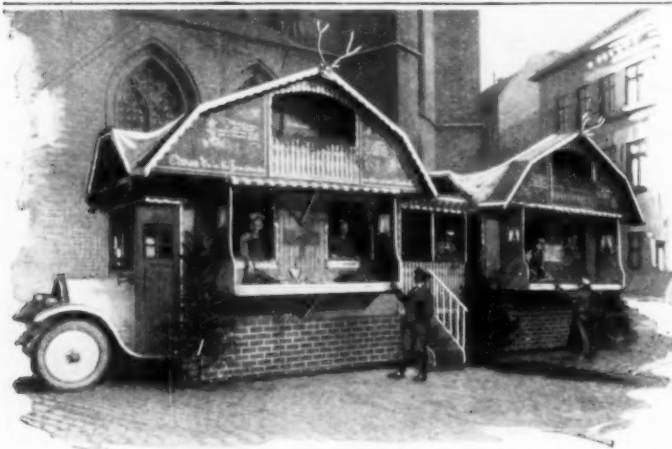
van is quickly converted into an open-air shop when a stop is made. The owner has made successful tours with the outfit, which attracts wide attention.

STARTING POINT OF U. S. MAPS ON KANSAS FARM

HOME AND STORE ON WHEELS AIDS CANDY DEALER

By constructing a combined home and store on an automobile truck, an Austrian nobleman and his family are regaining

From the map makers' and surveyors' viewpoint, the hub of North America is a small marker on Meade's ranch in north central Kansas. It is one of many triangulation stations established by the coast and geodetic survey, but has been designated as the "primary station" after elaborate calculations. The site is marked by a



Candy Store and Dwelling on Auto

block of concrete with a metal plate, on which is engraved the customary legend of the survey department, but from a scientific standpoint the place is considered worthy of a more elaborate monument in keeping with its importance. A sixth of the world's land surface has been surveyed from this central point as a base, for it happens to be the spot where the two great arcs of triangulation, one extending along the thirty-ninth parallel

of latitude and the other along the ninety-eighth meridian of longitude, intersect. To establish the point, many years of surveying and a great number of calculations have been made. Canada and Mexico have agreed that this is the central station for surveys and, with its aid, and that of other similar stations, it is now possible to measure the distance between two points to an accuracy such that the error is seldom more than one two-hundred-thousandth part of the total distance.

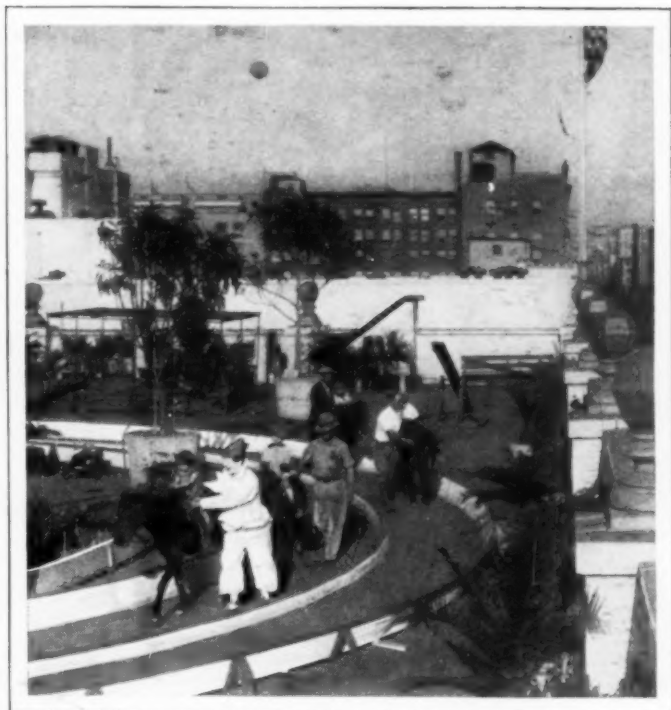
MEND SOCKS BY VULCANIZING

Vulcanize your socks instead of darning them is the suggestion of a German inventor who has developed a process of repairing the articles in this way, to save time and labor. An adhesive fabric is placed over the hole, a hot iron applied and the result is said to be a neat and durable mend that can scarcely be detected.



Vulcanizing His Sock; Hole Is Covered with an Adhesive Fabric and Hot Iron Applied to Fix Patch

The material is furnished in a variety of colors and textures.



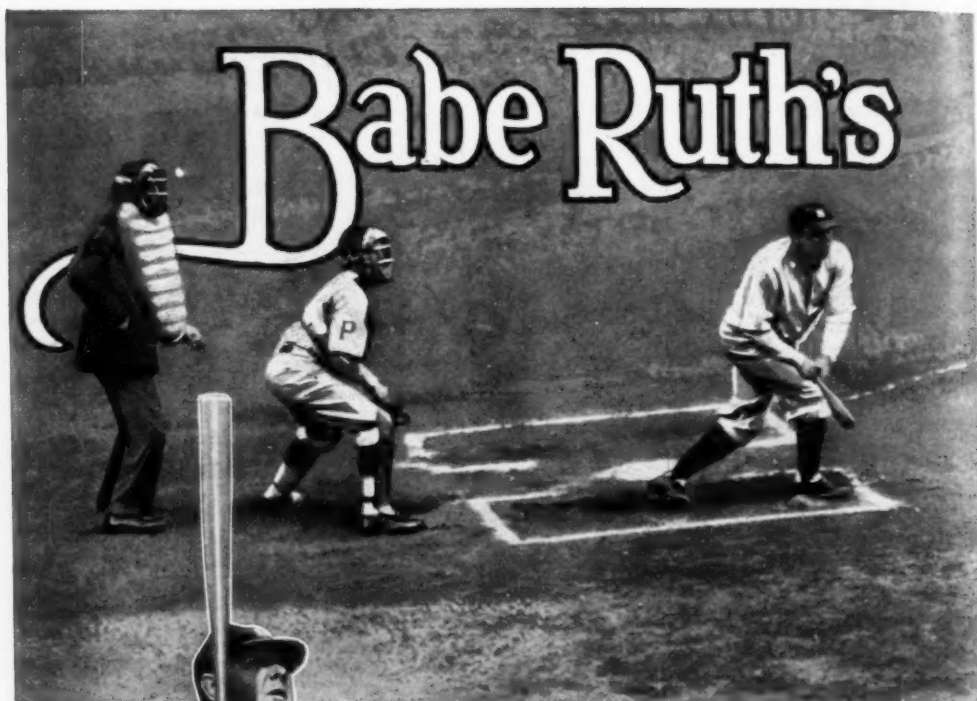
Where Children Play While Their Mothers Shop; Amusement Park on Top of Los Angeles Store Showing Part of Bridge Path

PLAYGROUND ON STORE ROOF AID WOMEN SHOPPERS

Swings, teeterboards, and many other amusement devices, are provided for children in a roof-top playground on a department store in Los Angeles. While the mothers are shopping, they can leave their youngsters in charge of attendants on the roof.

TOOTHBRUSH IS USED ON EYES TO CURE DISEASE

By the use of a common toothbrush, with the bristles clipped short, Dr. John McMullen, a United States public-health surgeon, has made progress in the cure of trachoma, a painful eye disease commonly found in parts of the south. The infection first attacks the eyelids, then the eyeball and may eventually cause blindness. The doctor found that, by using a local anesthetic on the lid, then scrubbing it off with the short-bristled toothbrush, diseased tissue was removed and the sound, though tender, flesh was healed.



Babe Ruth's

By A. A. ALBELLI



With Feet Crossed at the End of a Mighty Swing, the King of Swat Follows a High One with His Eyes

THAT stodgy urchin who used to catch for a school baseball team years ago, now grown to be the greatest figure ever known to the sport, told me the other day that he expects to clout 100 homeruns for the New York Yankees next season.

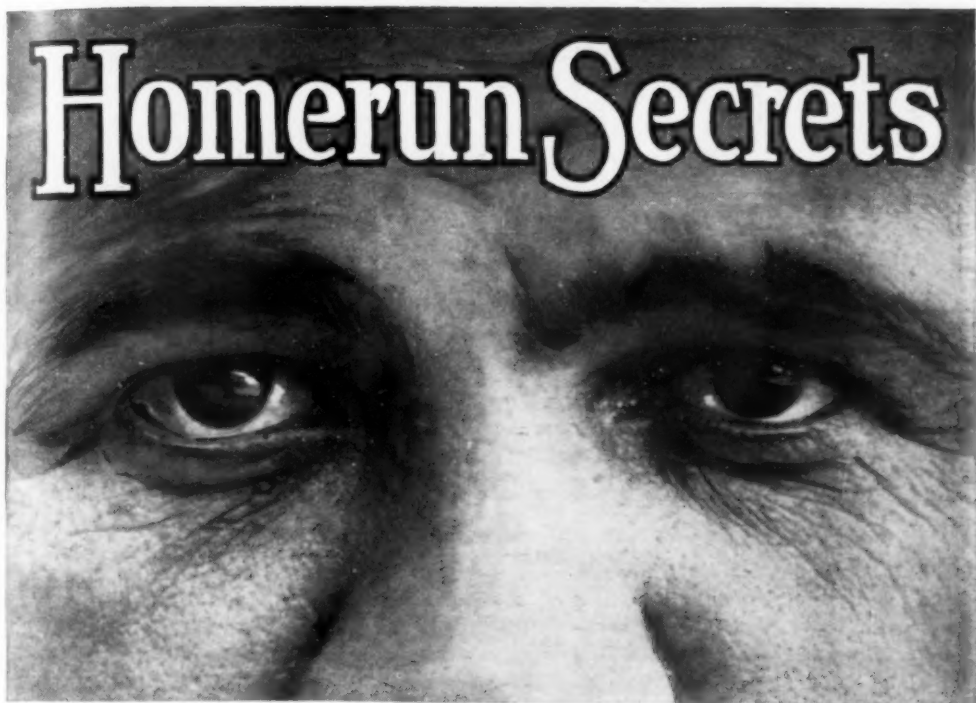
There is nothing of the braggadocio about Babe Ruth. He is all that baseball-loving America looks for in its idol. The halo which popularity has woven about him has not changed his boyish personality.

"The way I have come to feel," he said, "I can knock out 100 homers any old season from now on." During the 1927 season he reached the record of sixty circuit drives. To this he added two more when the Yankees played the Pittsburgh Pirates in the world's series.

"The only thing that will prevent me from slamming out a century-fold of home runs," continued Babe Ruth, "will be unobliging pitchers. I mean, the boys on the mound are beginning to know what I pick at for good drives.

"They all know I hate a slow curve. It's

Homerun Secrets



The Highest-Paid Pair of Batting Eyes in the History of Baseball Carried the Babe to a New World's Homerun Record Last Season, Breaking His Own Previous Mark

no secret. What I like best of all is when they steam over fast ones. Those are the ones I nibble at every time.

"Then there's another thing. You know a lot of times a twirler will toss them at me and all around me, but never within line of a good swing. I am not accusing anyone of letting me walk to first intentionally. But you know, I kind of get that feeling."

"How would you explain, shall I say the mechanics, of your homerun swatting?" I asked him.

The big fellow pondered a little while.

"Well, I'll tell you. It's hard to say which element comes first. Co-ordination, that is perfect timing and harmony of action, is a great essential. You have got to develop rhythm and full utility of every muscle.

"My whole body goes with every swing. I swing right from the hips. And those who have seen me take a healthy sock at a ball know what I mean.

"With that co-ordination there is the fact that I assume that strength is behind it."

During the season, Babe Ruth explained, he weighs around 210. He towers over six feet. His shoulders are broad and massive. Yet there is one incongruity. His wrists are very small.

"So, with this might and brawn which I try to keep in the pink of condition, I cannot help but feel that something is bound to happen to the ball when I lean on it. I might tell you I have another trick of keeping the right foot behind the left, not very much. But that helps. I bat left-handed you know.

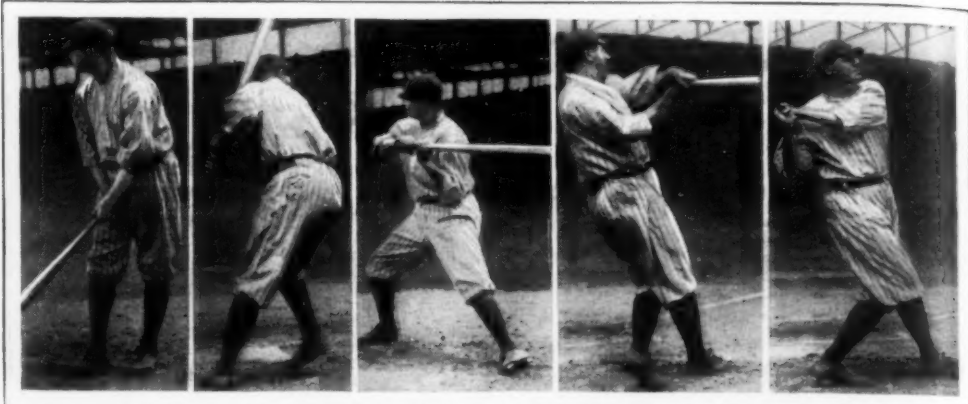
"Then the eyes play a great part. Oh, yes, the eyes have got to be well educated. I would be lost if I didn't have a sense of judgment which the eyes give me.

"As for trying to control the drive itself, I always aim to slam the ball out on a straight line. Pop flies are a little too dangerous. A lusty drive to the bleachers is sure to do the trick.

"There's a little buddy we must not forget," said Ruth, picking up his bat.

"Look it over," he said, proffering it to me.

It was very heavy, as bats go. It re-



© U. & U.

Knocking Out a Homer, a Series Showing Ruth as He Steps to Bat, Facing the Pitcher, Starting the Swing, in Mid-Swing, and, Finally, Following Through after the Ball

mindful one of the club of a Neanderthal man.

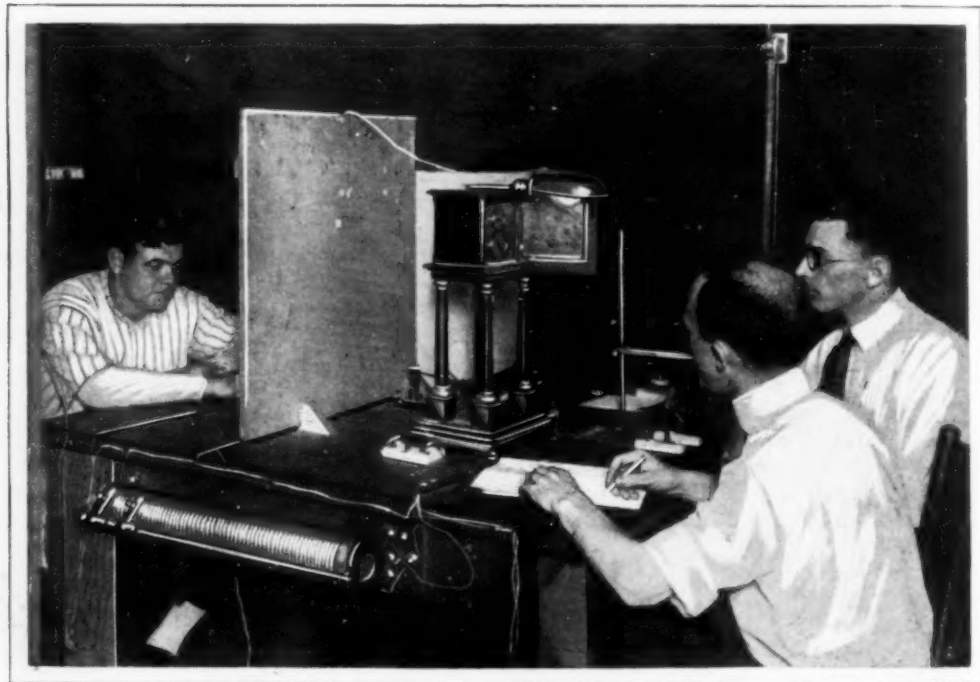
"It's the heaviest bat in baseball," he said. "It weighs fifty-four ounces.

"Now that we have the hitting of the ball done away with, there remains another very important job and that is circling the bases. I don't care what anyone says, but a batter is lost, no matter in what

part of the field he hits a ball, if he cannot run fast.

"I came to appreciate that fact long ago. I don't do a hundred yards in ten flat. But I'd bet I wouldn't come far from it. Being a speedy runner, then, is another very important factor.

"Of course, when the player is off the baseball diamond, he must not think that



Ruth Being Tested in the Psychological Laboratories at Columbia, Where It Was Found the Co-ordinate Speed of His Eyes, Brain, Nerves and Arm Was Ten Per Cent Faster Than the Average

he can forget his condition. He has got to keep in trim all of the time. He has to follow a strict code. He must do nothing to impair his physical condition."

Babe Ruth, who has hit 416 homeruns in the big leagues since he started with the Boston Red Sox in 1915, has had so glamorous a career that his name means as much to the American boy of today as the names of any three heroes from the pages of history.

"And I am not through yet by any means, as you can judge from what I said about a hundred homers," he said. "I am now thirty-four, and expect to be going strong at forty-four."

Ruth went on to tell the story of his life without any compunction, always clinging to a modest vein.

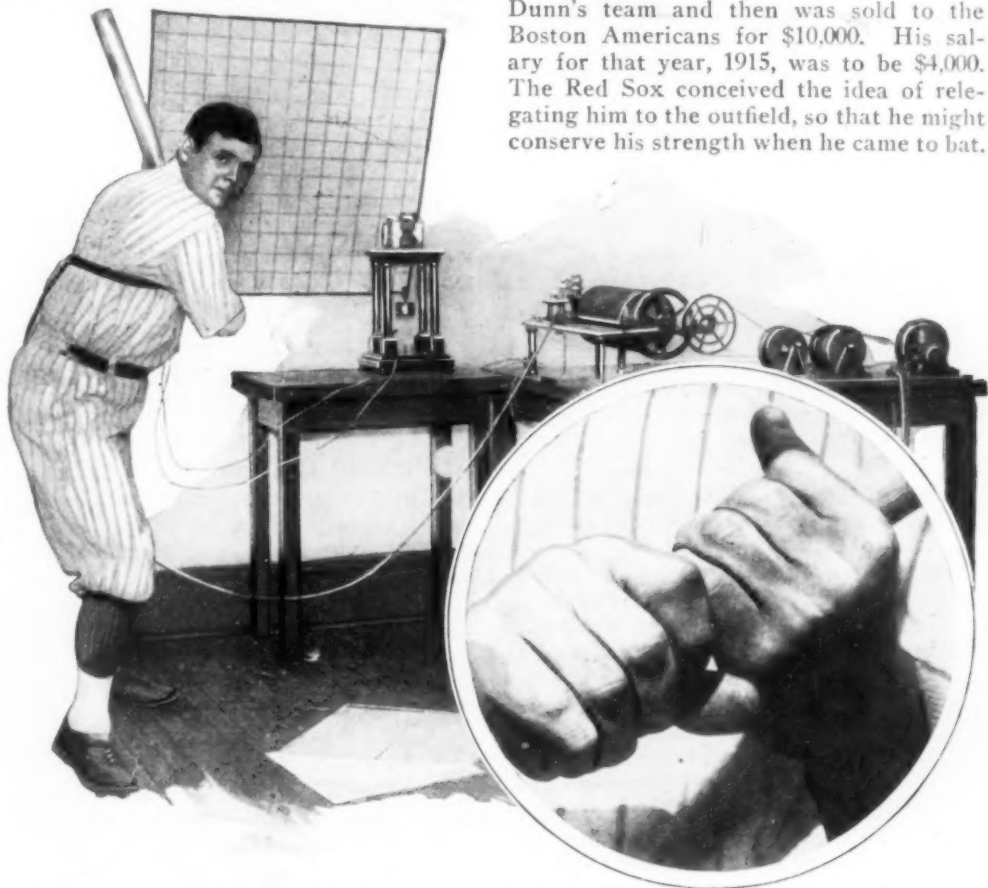
He was born in Baltimore, Md. His father was a factory hand. They were

poor. At times his mother had to work in a mill to help replenish the family larder.

George Herman Ruth, which is the homerun king's real name, was healthy and husky as a boy. At the age of seven he was sent to St. Mary's industrial school, in Baltimore. It was there that he got his first inkling of baseball. He started off by being the catcher of the team. In 1913 the school team already had a reputation. Babe Ruth was the southpaw pitcher about whom people were beginning to talk and predict things. He was also a good batter.

That winter, Jack Dunn, then manager of the Baltimore eastern-league outfit, saw Ruth. The lad was not yet twenty. Dunn wanted Ruth for his team, but was told that he could not get him without legally adopting him, because he was still a minor, which he did.

The following season Ruth played with Dunn's team and then was sold to the Boston Americans for \$10,000. His salary for that year, 1915, was to be \$4,000. The Red Sox conceived the idea of relegating him to the outfield, so that he might conserve his strength when he came to bat.



Measuring the Timing of One of Ruth's Mighty Blows and, at the Same Time, the Depth and Evenness of His Breathing; Inset, a Close-Up Showing How He Grips the Bat

He started out as a pitcher with them. In 1919, Babe Ruth won his first real spurs. That year he broke the major-league homerun record with twenty-nine homers. In January, 1920, Harry Frazee sold Ruth to the Yankees for \$150,000. His salary leaped to \$10,000 a year. In the season of that year, Ruth made his debut under the Yankee standard with a total of fifty-four round-the-bases hits. The following year his number mounted to fifty-nine. The year 1922 was the dark age of his career. He promised to come

back and, in 1923, made forty-one homers. He added five the next year. Then came another relapse. In 1925, he fell back to twenty-five homeruns. He made it forty-seven in 1926, and then this last season, he proved his mettle with the sixty.

In 1926, his earnings were \$250,000. Last March, Jake Ruppert, the Yankees' owner, gave Babe Ruth a three-year contract for \$210,000. With the close of 1927, Babe Ruth was hoping to have earned \$200,000 from sidelines, of which he had many.

SPARK-PLUG PRESSURE TEST SHOWS UP DEFECTS



Testing Spark Plugs under Pressure, to Reveal Defects That Might Appear in Actual Operation

Many spark plugs will spark satisfactorily under normal atmospheric pressure, but fail to function under the sixty or seventy pounds' compression to which they are subjected when installed in a running motor. Those that have this defect are said to be readily detected in a pressure tester. It is a simple outfit, consisting essentially of a cabinet with connections to a lighting socket and to the regular compressed-air line. The spark plug to be tested is screwed into an opening, connected to the electrical circuit and firing accomplished by pressing a button. The air pressure can be regulated by a valve. Motor authorities report that one automobile out of every four is regularly

failing to run at full efficiency owing to imperfect spark plugs, and many of these cannot be detected by the methods usually employed in testing.

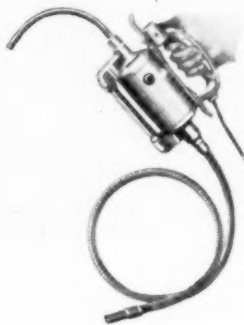
SPECIAL NAILS FOR CONCRETE SIMPLIFY BUILDING

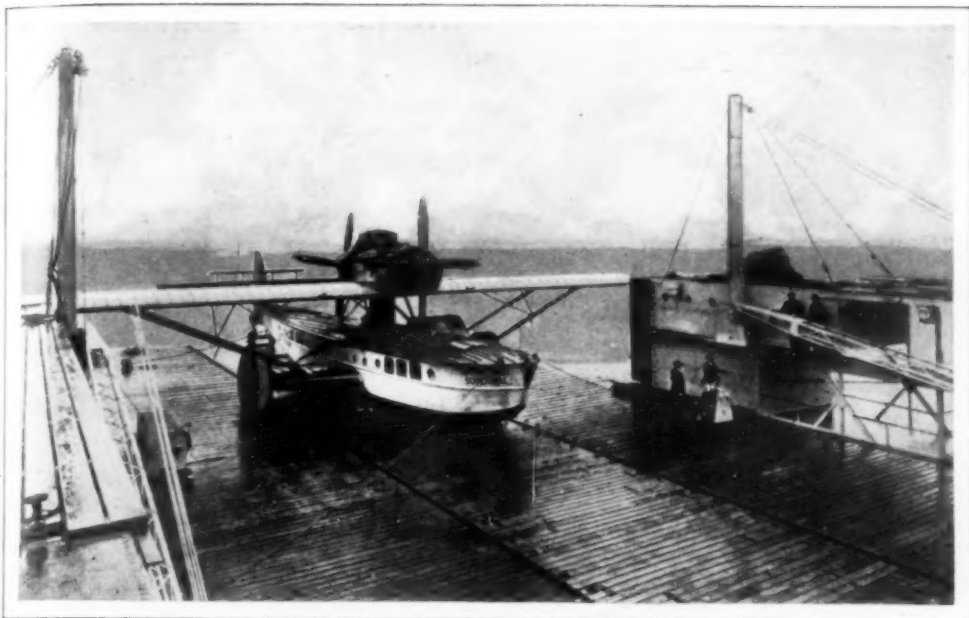
With the aid of specially formed steel-wire nails and anchor plates, the task of fixing wooden units or strips directly to concrete surfaces has been greatly simplified. The nails are of a temper that will permit them to be driven into the hard cement without bending, and the plates are adjusted to form a strong support for tile, joists or other members of the construction.

GREASE EXTRACTOR FOR AUTO PROLONGS CAR'S LIFE

Old grease is quickly removed from the auto transmission and differential at the rate of two pounds per minute with a simple extractor now on the market. It is electrically driven and functions by a worm in the nozzle that makes 7,000 revolutions per minute.

It also can be used to fill the cases with new grease. Just as draining the oil before a new supply is introduced gives better lubrication, removing the old before applying fresh, helps prolong the car's life.





A Floating Drydock for Big Ships of the Air; First Unit of Its Kind in Service in Germany to Facilitate Repair and Other Service; It Weighs 100 Tons

DRYDOCK FOR FLYING BOATS LATEST AVIATION AID

Development of commercial aviation has demanded the installation of various kinds of repair and other equipment and one of the units in this line is a drydock for flying boats. It was recently completed in Germany and has been placed in service to simplify the task of caring for the air-water craft. It weighs 100 tons.

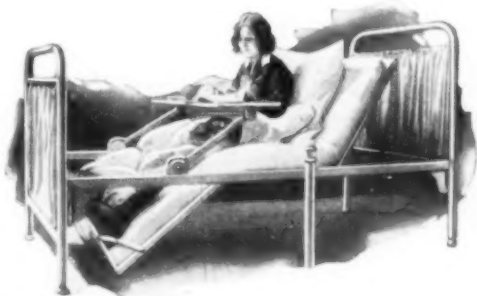
U. S. FARMERS PRODUCE MORE

American farmers produce more per man than growers in any other country, according to Charles J. Brand, who was connected with the department of agriculture for more than twenty years. In 1870, the individual production of grain per acre was 12,000 pounds. In 1925, it had increased to 25,000 pounds. Since 1890, farmers have increased their wheat yields by seventeen per cent, oats by fourteen per cent and potatoes by thirty-nine per cent. In 1880, less than twenty farm acres to each farm worker were used, but the average farmer now cultivates thirty-three acres. There has been a marked increase in the yield of eggs and development of live stock, such as hogs and cattle. Accord-

ing to Mr. Brand, one of the chief problems now before the American farmer is to grow the same quantities at smaller cost per unit of production. Cultivating fewer acres at greater profit is one of the main objectives, he says.

BED THAT FOLDS INTO CHAIR HELPS CARE OF INVALIDS

Arranged so that it can be quickly converted into a chair without removing the occupant, a folding bed, recently introduced abroad, is also equipped with a table, for reading or serving meals. This saves lifting a sick or injured person about and also saves room.



© Henry Miller
To Simplify the Care of Patients; This Bed Folds into a Chair, as Shown, without Removing Occupant

ANCIENT ART OF WIG-MAKING ADDS TO OPERA LURE



Wig Foundation on Block; Adolf Senz Inspecting Head Dress Fashioned for Olga Kargau and Fitting Wig on Augusta Lenska; a Detail of the Dressing and Curling when Wig Is Finished

With suitable hair costing from fifty cents to \$50 an ounce, the making and care of wigs for a theatrical organization is an important task. The Chicago Civic Opera company, for instance, kept 150 dozen on hand this season. They are valued at more than \$25,000 and represent practically every style of coiffure devised by the human mind since wigs were first worn many thousands of years ago. A visit to the studio and workshop of Adolf

Senz, the company's wig maker, and one of the few men in the world who thoroughly understands this ancient craft, reveals that a good wig has springs in it, eight of them, to hold it securely in place; that the hairs are intricately woven into a silk-and-mesh foundation with a special needle, instead of being glued on as is sometimes supposed, and that some of the wigs are fashioned of split hair. Chinese hairs, for instance, are often so coarse

that each one can be split into three. Practically no artificial or animal hair is used, as it does not last, will not dress well, and the illusion it makes is not so realistic. Most of the hair is imported, for there is a scarcity of long hair in this country since the bob craze. Careful measurements are made of a character's head, the foundation for the wig is laid out on a block, then the hairs are woven on. The entire process sometimes takes more than a week. Dressing them after they are done and packing and remodeling them call for expert care and handling. Opera and theatrical producers consider the wig one of the most important of all the items of costume, for it changes the wearer's appearance more than any other, one article.

MOVING SIGN AT REAR OF AUTO SERVES AS AN AD

Signs in moving letters have proved effective for advertising and other purposes, and now a western motorist has devised a way to adapt the idea to his automobile. By means of a gear-and-ribbon arrangement, the car is made to reel off a legend at the rear which is visible word by word, through a slot in the cabinet that conceals the machinery. The scroll had a capacity of 250 words which could be increased to 600, the inventor declared.



Motion Sign at Rear of Auto; a Reel with Words on It Turns as the Car Proceeds



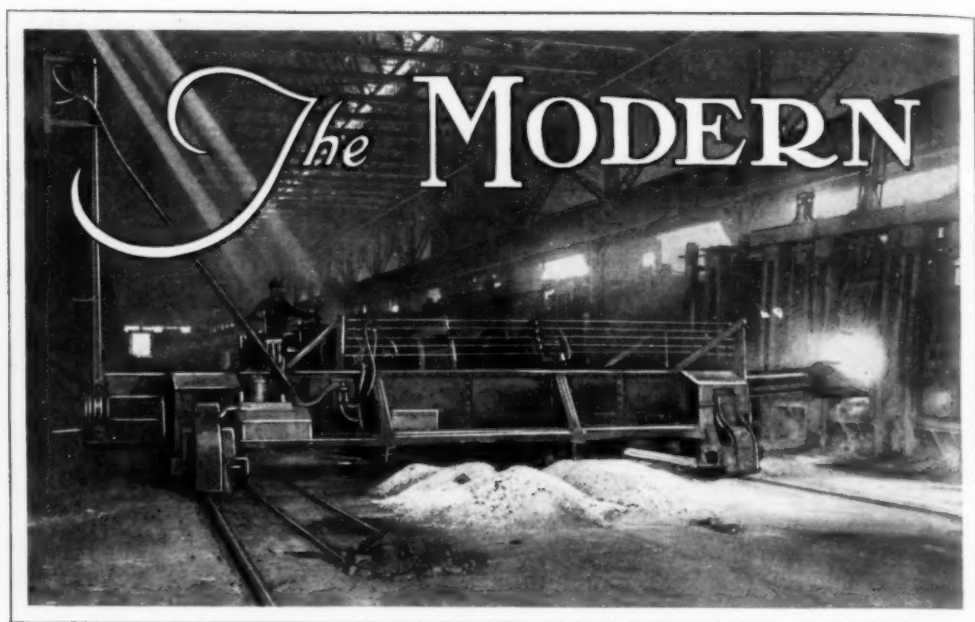
Russian Architecture in a German Church; Memorial Structure in Leipzig with Its Huge Tower

CHURCH IN FORM OF BIG TOWER BUILT IN GERMANY

A striking example of Russian architecture has been introduced in Leipzig, Germany, in a memorial church recently dedicated there. Its main feature is the unique tower that rises from a tapering, broad base. Windows pierce the sides of the tower and a dome surmounts it.

FIND NEW LAKE AND VOLCANO IN ALASKAN WILDS

Aerial surveyors, after further mapping of Alaska, report the discovery of a lake, a river and an active volcano in a district that previously appeared as a blank space on the maps because no one knew what was in it. More than 2,000 square miles of territory were surveyed from the air in the Alaskan range and adjacent country. The stream is the river Chatkachatna, which rises from a lake and has an average speed of fifteen miles an hour. The peaks in the region are extremely steep and rugged and from the highest, Mount Spurr, a plume of steam, rising a thousand feet in the air, could be seen.



Charging Machine in a Steel Mill; with a Giant Finger, as Clever as an Elephant's Trunk, It Picks Up Iron Boxes of Raw Material and Dumps Them into the Blazing Pits

A GERMAN scientist recently succeeded in producing transparent steel—in sheets so thin they are colorless, the eye can see through them, and even the camera is fooled.

American steel men are producing heat-treated bars so enormously strong that great suspension bridges can be built of chains of them linked together, instead of the usual process of using thousands of steel wires laboriously "spun" back and forth across the river until great cables are built up.

With those two extremes of steel, and all the wonders of new alloys that lie between them, the modern metallurgist out-rivals the alchemist who labored unsuccessfully to turn baser metals into gold.

Despite all their queer ideas and amusing methods, the secretive alchemists of old did one good thing for the world, for they founded the science of chemistry, and, worshiping fire as a magical force, perfected the first smelting furnaces, retorts, crucibles, flasks and curiously designed glassware of a modern laboratory.

In his crude brick furnace with hand-operated bellows—the witches' caldron that cost more than one alchemist his life—the chemist of the Middle Ages could

generate a heat of about 1,700 degrees centigrade, so lack of efficiency in the apparatus used was to blame for many of his failures.

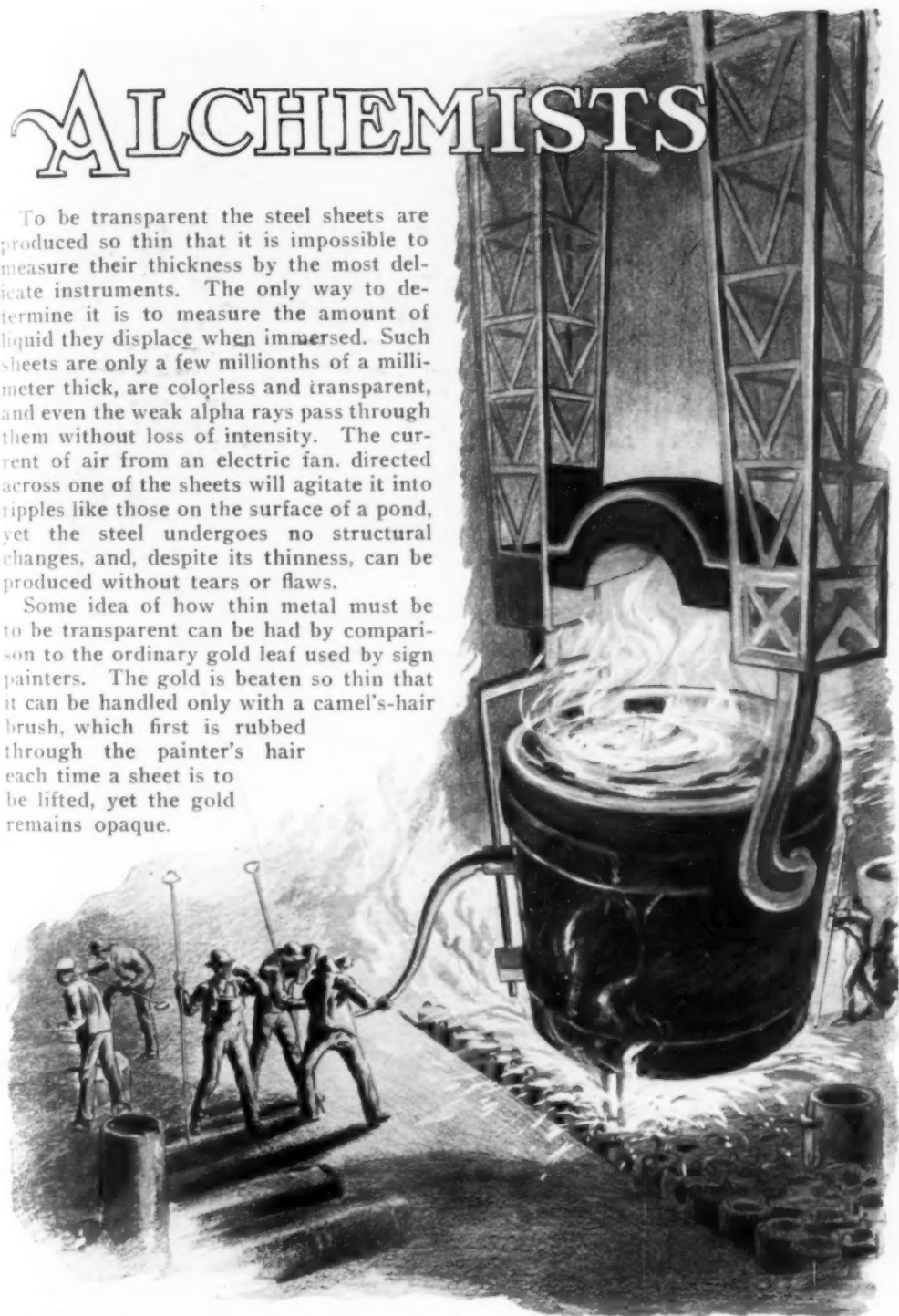
What he couldn't do, the modern metal worker, with an electric furnace producing temperatures up to 5,000 degrees, can accomplish with ease. Basically, the modern alchemist's equipment is only a refinement of the methods of the Middle Ages, but the refinement has gone so far that the modern metal chemist can tell just what a steel cable needs to hold up a giant bridge, how the piston rod of an airplane should be made to withstand thousands of impacts per minute, what the springs of a railroad car must endure when traveling at a mile-a-minute speed, or how thick the insulation on an electrical cable must be to carry enormous voltages.

The transparent steel of Dr. Karl Muller, recently exhibited in Berlin, and the massive heat-treated eyebars of the new Carquinez bridge in California and the Florianopolis bridge in Brazil, both are products of modern alchemy. Two years ago Dr. Muller succeeded in producing transparent gold and nickel, and he has now adapted his process for practically every other metal.

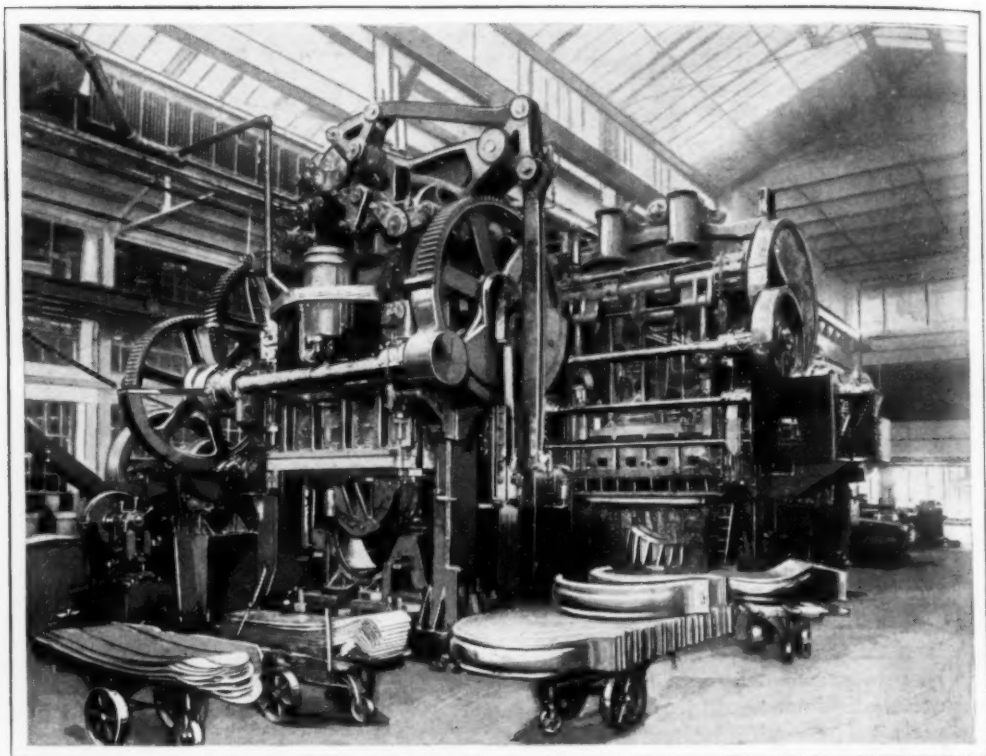
ALCHEMISTS

To be transparent the steel sheets are produced so thin that it is impossible to measure their thickness by the most delicate instruments. The only way to determine it is to measure the amount of liquid they displace when immersed. Such sheets are only a few millionths of a millimeter thick, are colorless and transparent, and even the weak alpha rays pass through them without loss of intensity. The current of air from an electric fan, directed across one of the sheets will agitate it into ripples like those on the surface of a pond, yet the steel undergoes no structural changes, and, despite its thinness, can be produced without tears or flaws.

Some idea of how thin metal must be to be transparent can be had by comparison to the ordinary gold leaf used by sign painters. The gold is beaten so thin that it can be handled only with a camel's-hair brush, which first is rubbed through the painter's hair each time a sheet is to be lifted, yet the gold remains opaque.



Pouring Castings from a Huge Ladle of Molten Iron in a German Foundry; the Big Pots Are Lined with Thick Walls of Fire Clay to Protect Them from the Intense Heat



Fender Press in a Detroit Automobile Factory, Which Takes Flat Sheets of Steel and Presses Them into the Intricate Shapes of Full-Crowned Auto Mudguards

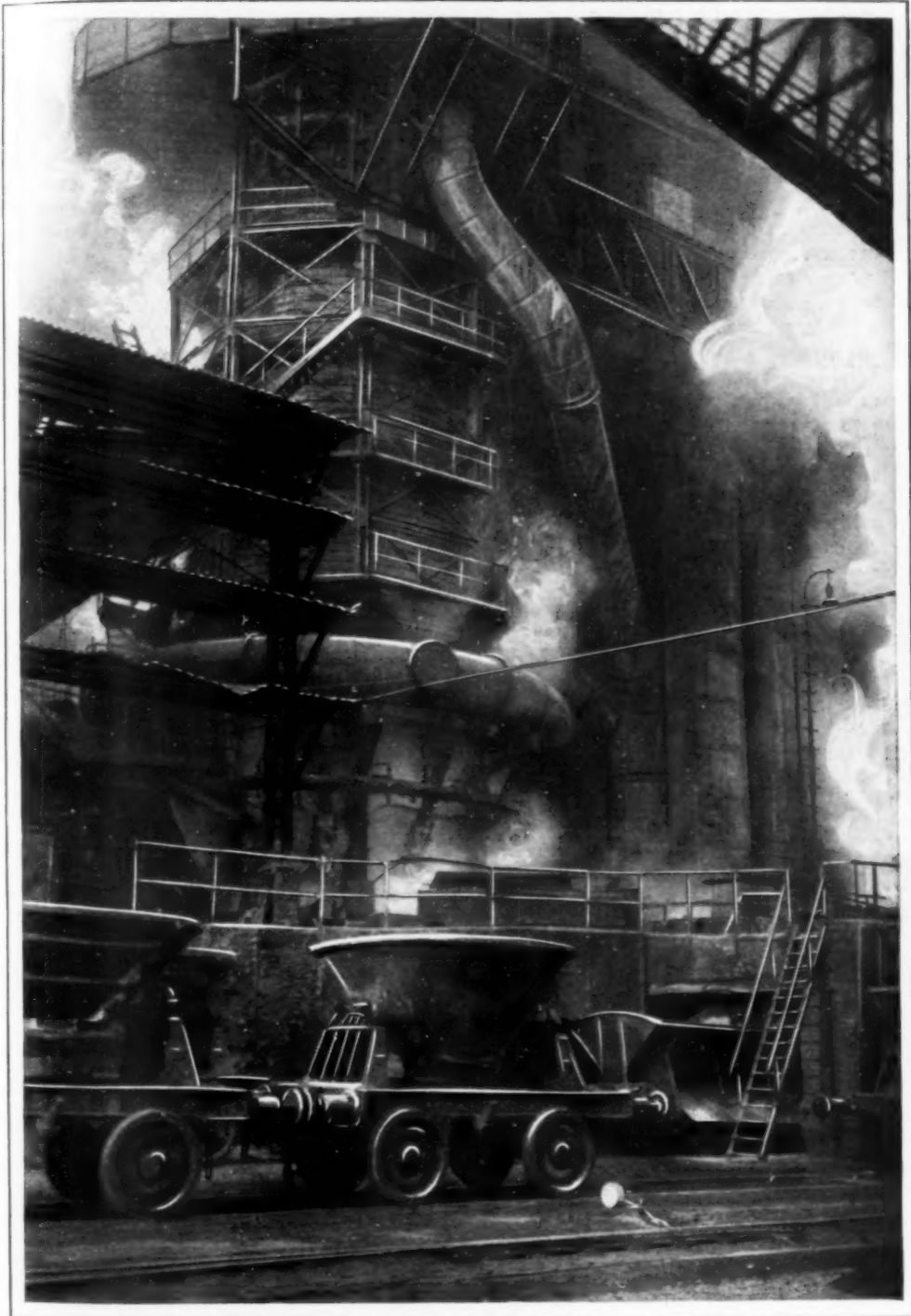
The properties of the transparent steel indicate it may find a wide field of usefulness. It transmits light, electric currents, cathode, Rontgen and radioactive rays, it can be magnetized, and it has a minimum of weight and is a very poor heat conductor.

Already successful experiments have been made in applying it to diaphragms in telephones, microphones, medical instruments and apparatus for talking movies. It has the advantage of reproducing tones without distortion because its mass is so infinitesimal. Ordinary speech reproducers are limited in range because of distortion due to the thickness and weight of the metal diaphragm, whereas the transparent steel will not only reproduce all audible tones faithfully, but records vibrations both above and below the range of the ear. Because of its electromagnetic light sensitivity it may be useful in radio and telephone picture transmission, while in the study of steel structure under the microscope the fact that it preserves its

character unchanged will make it particularly useful. The German dye industry is experimenting with the production of hitherto impossible emulsions, using the steel sheets to reproduce tones of an inaudible wave frequency, giving an audible check on the chemical process.

The other laboratory products of steel, particularly the alloys with other metals, are finding constantly increasing use. Modern automobiles are made up of dozens of different kinds of steel, each selected for its special properties in some particular application.

Bridge engineers have been particularly active in the search for new materials, including what the steel men call "strong steels." White and Hazard introduced them first in 1816 when they used steel wire for the first time in bridge building, and wire reached its greatest height of development in the new Philadelphia-Camden bridge. The Hudson river bridge, which will surpass the former in size, probably will be of wire construction, too,



Scene in a German Blast Furnace; the Enormous Pile in the Background Melts Down the Raw Ore and Extracts the Iron, While the Trains of Ladle Cars Carry It Away



though the bids were taken for both wire and heat-treated eyebars.

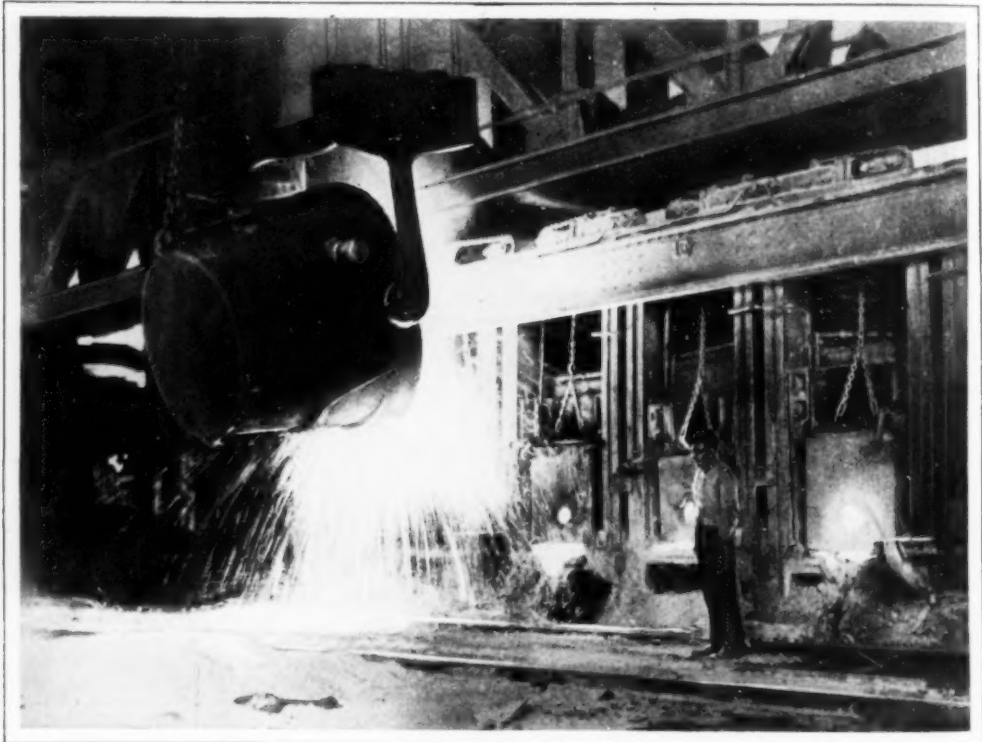
Bridges built of modern steel cable will endure for centuries, according to H. C. Boynton, metallurgist of John A. Roebling's Sons Co., which built the Brooklyn bridge. Samples of wire taken from that structure, and from others built since, show exactly the same chemical and other properties as newly drawn wire. Barring some unforeseen catastrophe and failure of proper care, there is no reason, he told a recent steel meeting in New York, why the bridges shouldn't last for many hundreds of years.

Whether bridges built of heat-treated bars will last as long, is doubtful, according to some civil engineers, but their use in the new 2,690-foot bridge connecting Florianopolis, capital of the state of Santa Catharina, Brazil, with the mainland, will provide an interesting test. The Brazilian state capital is located on an island, and has never had any direct connection with the rest of the state. With the new bridge across the strait to the mainland, and the

completion of 100 miles of railroad to link up with an interior road between Rio de Janeiro and Montevideo, the state capital is expecting considerable growth.

The bridge is a novel example of construction not only because of its size, but because the two towers, each 230 feet high, which support the ends of the main suspension span, itself 1,113 feet nine inches long, are so built that they rock on their base, instead of being heavily reinforced and fixed, as are the masonry and steel towers of the larger American bridges. The steel bars which form the suspension, in place of the more commonly used wire cables, are treated until they stand a load of 75,000 pounds to the square inch.

All of the 4,400 tons of steel used was made in the United States and was shipped by steamer 6,000 miles, to the northern end of the island on which Florianopolis is located. Because of the shallowness of the strait, through which only small coasting vessels can pass, it was necessary to transship the material to lighters for the final journey down to the material yard.



Charging an Open-Hearth Furnace with a Ladle of Molten Iron; the Open-Hearth Method Is Widely Used in Making Steel from the Iron Extracted in the Blast Furnace



Teaching an Entire Class of Deaf Children at Once; Instructor's Voice Is Amplified and Relayed through Headphones

RADIO AMPLIFIER HELPS DEAF IN LEARNING SPEECH

Deaf children who still retain fifteen per cent or more of their hearing, are taught in large groups with the aid of an improved apparatus which operates on radio principles. It picks up sounds through an ultrasensitive microphone in the top of a cabinet, amplifies them, and transmits them to headsets which are plugged into a socket at each pupil's desk. At each seat is also a dial control by which the volume of the incoming sounds can be regulated. With this installation, classes numbering up to fifty may be taught simultaneously, the pupils can hear their own voices and the instructor does not have to stand in front of the microphone, as it is so sensitive it picks up sounds from any part of the room.

EIGHT YEARS OF WORK IN LIFE IS MAN'S AVERAGE

According to recent calculations, the average man works less than eight years of his life. This estimate is based on the assumption that the usual working time is eight hours a day and that the average

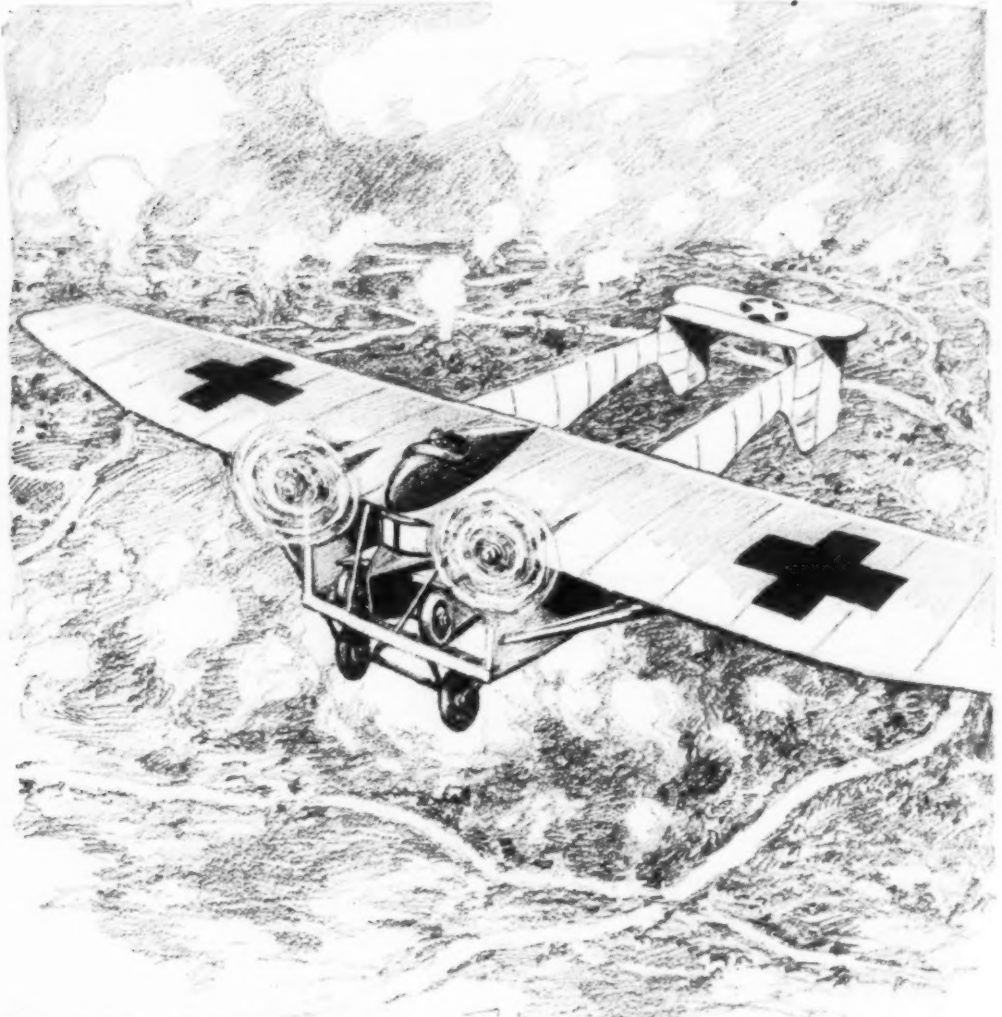
man is at least sixteen years old before he starts serious work. The general active period is thirty years, so the person who labors eight out of each twenty-four hours for thirty years, has done ten years of work in his lifetime. This includes Sundays and half holidays. Deducting those and six months' allowance for illness, leaves about seven and a half years of actual work for the average life.

RUBBER BULB IN VALVE TESTER SHOWS IF AIR LEAKS

Leaky automobile valves are quickly detected with a simple tester now on the market. It consists chiefly of a steel collar, or socket, in which is affixed a strong rubber bulb in the shape of a half ball. By a slight squeeze on the bulb, after the valve is in place, the user can tell if the valve leaks, as the ball will yield when the air escapes or remain firm if the valve is properly seated.



FLYING HOSPITAL PLANE CARRIES LOADED AUTO



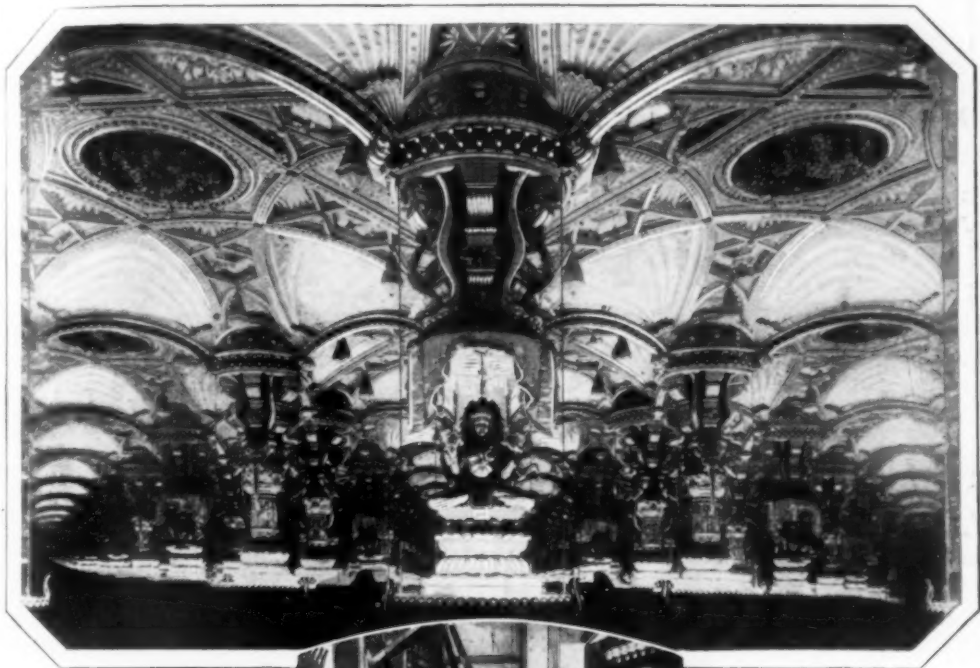
Motor Ambulance Installed in Plane for Emergency Trip through the Air; Note the Plane's Two Bodies

A flying ambulance, which is an ordinary motor car when on the ground, but can take a place in a plane and become the body of the ship when it takes the air, has been designed by M. P. Delcourt, of the Eiffel laboratories, at Saint Cyr, the French West Point. The airplane part of the machine is a big monoplane, with the usual thick wing, on top of which is a small streamlined car containing the pilot's seat and controls. Instead of the usual fuselage, it has two bodies, each leading back from a motor gondola. The bodies are

joined beneath the wing to form a floor on which the ambulance is anchored while in flight, and are joined again at the tail to form a stabilizer above the two rudders. The ambulance is driven onto the floor and fastened in place. It has a streamlined body to reduce air resistance.

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

PALACE OF MIRAGES PRODUCES STRANGE ILLUSIONS



The Palace of Mirages, installed in the Grevin museum, Paris, is a veritable chateau of the Thousand and One Nights. The audience is seated in a hexagonal room, with partitions consisting of a series of mirrors framed by different motifs, columns and pedestals. These are covered by a cupola poised on projecting arches. Following the laws of optics, the illusion produced with the spectators is that of a multitude of identical rooms, placed side by side, radiating in all directions. In the center of the illusion one sees the real hall with looking glasses and six halls, twelve, eighteen, twenty-four, etc., up to the limit of perception. If it is lighted, either with the aid of visible electric lights or projections, the multiplication of mirrors will repeat a motif in all directions. At each angle of the room are installed six rotating



Inside the Wonderland of Magic Reflections, and, Control Apparatus by Which the Illusions Are Changed

drums, on each of which panels of glass, parallel two by two, form three concave angles of 120 degrees. One third of a turn of the drums completely changes the aspect of the room and its perspectives. Successively, the spectator finds himself placed in a Hindu temple, in an Arab palace or in the midst of a boundless forest plunged in darkness. The electric lighting permits no less than forty-five varied effects, giving place to a multitude of combinations. These effects are obtained by means of 2,500 different colored lights.

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 may be obtained, free, by addressing our Bureau of Information.



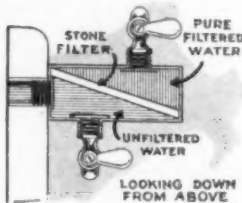
Shooting Life Line from the Pistol; the Flap Protects User's Hands from Powder Flash

LIFE-SAVING PISTOL SHOOTS LINE TO WRECKED SHIP

Pistols are generally associated with killing, but one recently introduced is intended to save lives by throwing lines to victims of shipwrecks or other disasters. To protect the user against the flash of the charge, a flap is suspended beneath the barrel. The pistol will hurl a slender cord for some distance and this can be used to pull a heavier rope aboard.

WATER FILTER FOR THE HOME IS SELF-CLEANING

Solid materials are removed from the drinking water by forcing it through a simple little filter which can be quickly attached and requires practically no attention. The filtering medium is a special kind of stone manufactured from white sand. The main water supply is forced through one side of the filter and



withdrawn, for washing or other purposes, at full pressure and without being filtered. But that which is intended for

drinking is taken from the other side of the stone, which is placed diagonally in the case. The solids removed are nearly all washed out with the full stream of incoming water so that the stone seldom has to be cleaned. The filter is easily connected by shutting off the water, removing the cold-water supply faucet, screwing the filter in place of it and then connecting the two outlet faucets to the filter.

AUTO HORN CONTROLS LAMPS TO GUIDE TRAFFIC

Traffic lights controlled by the sound of the automobile horn have been under tests in Baltimore, Md. A highly amplified microphone along the roadside, is made sensitive to vibration in such a manner as to change a green light to red. The lamps remain in this position for a few seconds and then automatically change back to the original signal. Under the present system, the lights are especially suited to guarding cross roads where fast-moving vehicles are common.

THREE-HEAT ELECTRIC IRON HELPS SAVE CURRENT

Buttons on the side for giving three different degrees of heat and a composition handle that fits the hand and stays cool are the chief features of an electric iron which effects a saving of current. Absence of a back plug saves time and trouble. The cord connection is flexible and swivels to both the movements of the iron and of the operator, while a heavy armor protects the covering from damage. Current is turned on or off by the buttons.



CORNCOB INCENSE

By soaking dry corncobs in fragrant oils, such as that of sandalwood, cinnamon or cloves, and then grinding them to powder, an effective incense has been prepared. White smoke and ashes are produced, and the substance is said to be superior to various other kinds.

The Latest in Furniture



Modern Design in Living-Room Equipment; the Screen Is Black and Silver, Upholstery of Davenport Is Blue, and Pillows Are of Calfskin

A REVOLUTION in furniture design to correspond with the changes in modern home and apartment architecture promises America a new furniture vogue as sweeping as the general desire for mission styles in the late nineties and first decade of the present century.

The new designs, sometimes called "venturus," take various forms, some embodying the skyscraper motif so distinctly American, but always combine simplicity in treatment, straight lines, and, often, the slender grace of Chippendale or Heppelwhite, in marked contrast to the massive heaviness of mission furniture.

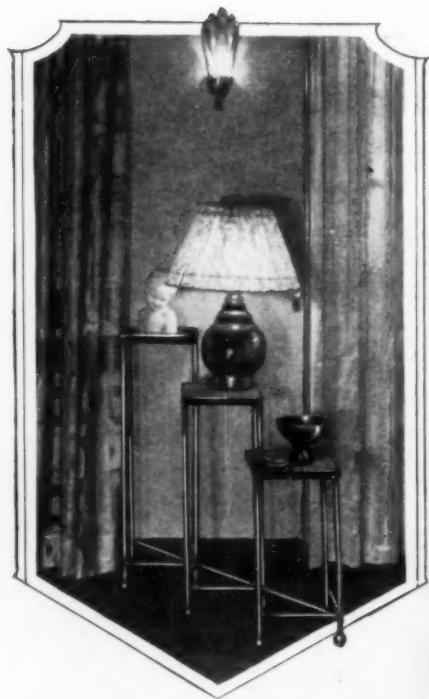
Height and slimness are the most usual characteristics—the skyscraper's lines applied to furniture—or the fashionable slenderness of modern dress design. Chairs have taller backs, wall pieces, particularly occasional tables, bookcases and the revived editions of the mid-Victorian what-not, all emphasize height, at the expense of width.

The reason for the change in furniture styles, however, lies in the changing Amer-

ican home—small apartments and small bungalows. Where overstuffed pieces, heavy mission furniture and similar styles cramp the small room in appearance, if not in fact, the new venturus art is designed to give an air of spaciousness and make low ceilings seem higher.

With apartments and houses growing smaller, with more built-in or disappearing furniture and other conveniences, it required a radical departure in design to meet the new limitations on interior decorating. The two or three-room with kitchenette idea, developed for small city apartments, is being applied in three and four-room bungalows. Many home builders, as well as apartment-house designers, have reached the conclusion that some of the things an older generation regarded as indispensable, are really unnecessary in this day and age.

Take dining rooms as an example. The idea of building a house without a dining room would have been unthinkable even a decade ago, but dining rooms can be, and are being, eliminated today. In their place



Above, Stand of Hollow Metal Tubing and, at Right, Electric Candle in Brass

the one-time butler's pantry becomes a breakfast nook, fitted with Pullman seats and table, which fold out of the way when not in use. The space that a dining room would take is partly added to the living room, making it as large as possible, and for more formal occasions, when company comes, a gate-legged table in the living room takes the place of a dining table. Smaller families, lack of servants, movies, bridge, the automobile, the prevalence of tea rooms and good restaurants, even in small towns, new ideas about health, the reducing craze, smaller meals, refrigerator cars that bring fruit and salad material the year around—all of these and many more factors have had a hand in the decline of the old-fashioned family dinner, a stately affair of many courses followed by a gorged nap.

If the family dines al fresco in a breakfast nook, off sandwiches, a salad and fruit,

it is possible to drop the dishes into the electric dishwasher and get away in time to see the first show at the nearest movie palace, go on to a bridge club afterward, or out in the country for an automobile ride.

A generation ago the housewife who had no servants didn't have time for matinees, teas and automobile rides because she had a dining room and an enormous kitchen to look after.

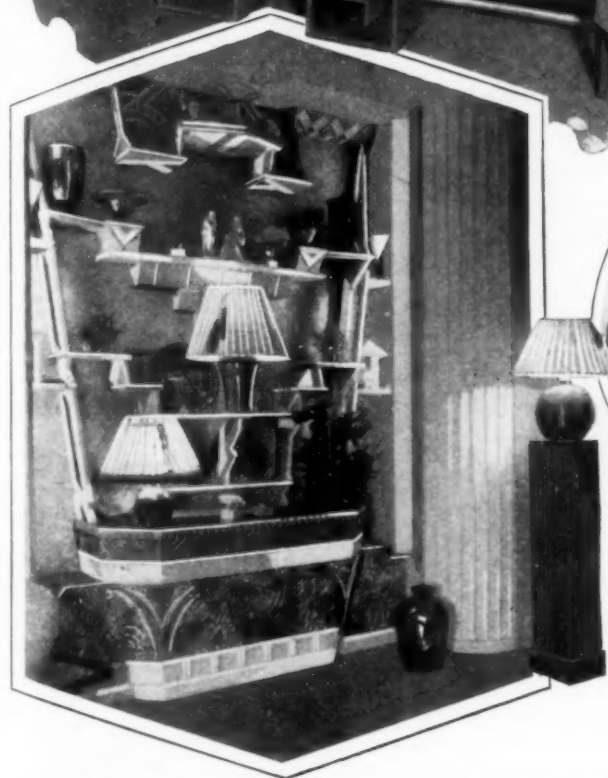
The new houses have small kitchens, too, and they are more scientifically planned. The latest thing in apartment-house kitchens is long and narrow—about as wide as an ordinary hall, and three or four times as long as its width. It is laid out like a Detroit automobile plant, for quantity production with the minimum of labor. Starting at the back-porch door there



At the Right, a Marble-Topped Table Distinguished by Its Metal Base in Artistic and Sturdy Design



are storage compartments (with outside filling doors for the delivery boys to de-



At the Left, the Whatnot of Today, a Roomy Cabinet in Geometric Patterns That Form an Effective Background for a Wide Variety of Objects; Above, Bedroom Furniture in the Latest Style, the Odd "Curled" Stand Being a Conspicuous Feature; Inset Shows One of the Latest Types of Kitchen Sinks with Convenient Spray Hose for Washing the Dishes; It Eliminates the Need of a Dishpan and Saves Drying by Hand

posit their packages without the necessity of a member of the family staying home to receive them) and an ice box, also with an outside door, if ice is used instead of artificial refrigeration. Next, on the same side of the long and narrow room, comes

a series of storage compartments, usually assembled from the units of white-enamelled metal kitchen furniture, and then a work table for preliminary cooking operations. Next to it is the stove, so that after the preliminary assembly job—to

use a factory phrase—has been completed by placing the food in the proper pots and pans, they can be placed on the fire without taking an additional step. Beyond the stove is the final assembly table, adjoining the door into the dining alcove or breakfast nook.

the aisle, and then the skill-ets and cooking pots, just across from the stove and work table



Dining Room in Center Is in Lemon Wood, Gold and Silver Colors; Above, Built-In Stand and, Below, Extension Wall Table for the Kitchen

where they will be used, while the utensils used in preparing the raw food for the stove come last, across from the food-storage boxes.

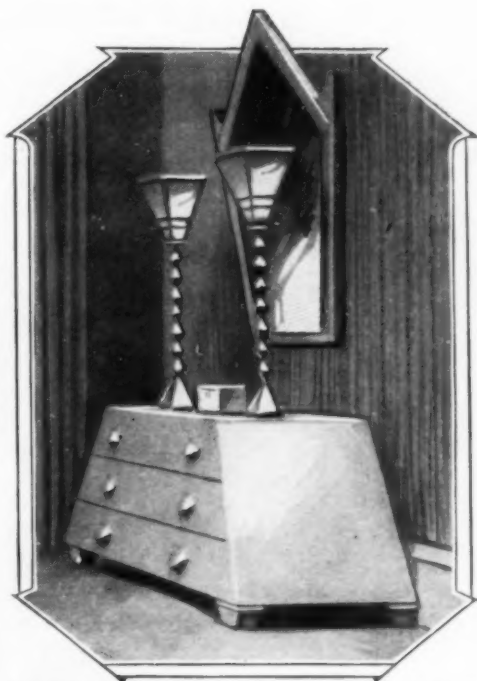
In such a kitchen everything moves from the delivery door at which the raw material is received in a direct line to the final assembly, and coming back, the utensils are so distributed that they are always within reach at the stage where they will be wanted again.

The new small homes likewise are eliminating the guest room, or at least one guest room, if more than one is needed. Instead of the expense of the extra room a small dressing space is provided, into which a folding bed, mounted on rubber-tired wheels, can be pushed out of sight. When the unexpected guest arrives, the

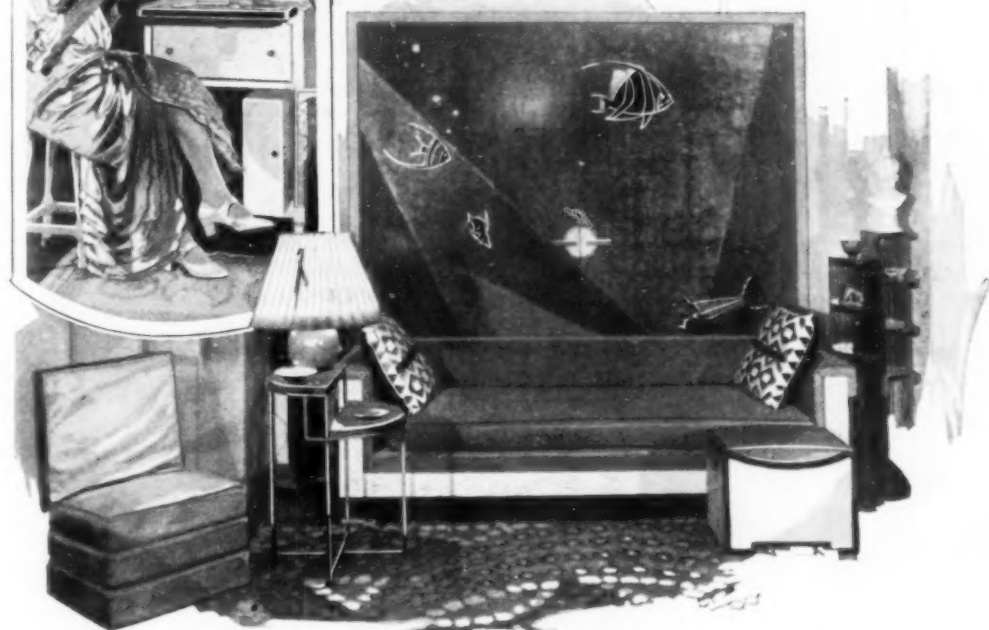
Coming back, on the opposite side of the room, first is a receiving table for the returning dishes, next the sink, which in the latest apartments has a built-in electric dishwasher, then a drying table, above which wall cabinets take care of the silver and glassware. Next are storage compartments for, first, the dishes which are needed at the final assembly table, across

bed can be rolled out into the living room, and the space it occupied becomes a dressing room, filled with a dresser, mirror and rows of hooks.

Even the bathroom is coming in for attention. For one thing, the bathtub is being eliminated more and more often because it takes up too much room and requires too much time and attention to keep it white and spotless. A shower bath occupies much less space, is far cheaper to install (for it can be surrounded with an ordinary plaster wall coated with waterproof paint) and it takes the minimum of care and attention. The shower bath is also a timesaver, for it eliminates waiting for the tub to fill and empty, and everything in the latest homes is being designed to save time.



Large Drawers and Unique Lights Distinguish This Dresser for the Modern Bedroom



Bright Color Touches and Simplicity of Line Feature This Living-Room Set with Its Metal Table; Above, Convenient Toilet Cabinet and Stand

LUMINOUS PAINT PRODUCES NOVEL STAGE EFFECTS



Decorating Objects with the Luminous Paint, and a Stage Setting as It Appears in the Glow of the Phosphorescent Covering

Among all phosphorescent substances, sulphate of zinc possesses an especially curious property. Upon being exposed to the sun or an electric arc, it absorbs the ultraviolet rays, and if then placed in a dark room it reveals a greenish-yellow light comparable to the nocturnal

sparkling of a glowworm. It can serve either for lighting purposes or as an ideal screen for the ultraviolet rays. Curious effects, and artistic and theatrical decorations are produced in this way. The sulphate of zinc, sold in the form of powder, is mixed with thirty to forty per cent of Canada balsam, liquid gum, white celluloid dissolved in acetate of amyl, or uncolored varnish. A paste is formed which is easily applied to the objects intended for display, whether made of cloth, metal, paper, cardboard or wood. Fans, masks and paintings also are treated with this phosphorescent application. After having designed and painted the objects in the ordinary manner, the decorator touches certain spots with the paste. Perfumers utilize sulphate of zinc, incorporat-

ing it in rice powder and other similar products. These luminous paints communicate to the skin a sparkle more vivid than nature in the semi-darkness of a theater box or a somber drawing room.

HONOR INVENTOR OF AUTO

Austrians have honored the name of Siegfried Marcus, credited with the invention of the modern automobile, by erecting a statue to his memory in Vienna. It is of unique design, showing an athletic youth cleaving his way through space, while a cast of the inventor's head is on a front panel. Marcus introduced an automobile as early as 1864, and, in 1875, he devised one that had many of the advantages of the car of today.

SUNSPOTS AND WEATHER

Predicting weather conditions on the basis of spots on the sun is a process surrounded with mystery to the layman and has inspired all sorts of foolish questions, according to Father Jerome S. Ricard, of the University of Santa Clara, world-renowned astronomer, but he holds that the method is essentially sound and points to his accurate forecasts as proof of the validity of his calculations. He explains that the occurrence of spots on the sun creates certain displacements in the ether which can be measured and their direction ascertained. These changes are carried to the atmosphere of the earth, resulting in disturbances. By noting the effects of rotations of sunspots, he is able to foretell their future effects on the earth. A comparison is found in the relation between motor and airplane. The propeller does not drag the plane through the air but, in whirling, creates a vacuum in front. The rush of air behind pushes the plane forward.

ROGUES GALLERY FOR STUDENTS SIMPLIFIES COLLEGE FILES

Drake university officials adopted the "rogues' gallery" method this season in making up office files of its students. Each was photographed with a card, bearing his or her name. The photos are filed with other student data for permanent reference.



Huge Statue of Washington Being Erected on Courthouse Dome; Pulling the Figure Across Preparatory to Lowering

THREE-TON STATUE HOISTED ON DOME

Engineers solved a difficult problem in hoisting recently, when they lifted a three-ton statue of Washington to the top of the dome of the Washington county courthouse, Pennsylvania. A special tower was built and connected to a smaller one on top of the peak of the dome. The figure was elevated on the main scaffold, hauled across the "runway" connecting the two and then lowered to its position on the smaller tower. In all, it was raised 175 feet.



Photographing Student with Name Card for Entry in College Files, the Latest Reference System

SYMBOLIC CARVINGS FOR NATIONAL CATHEDRAL

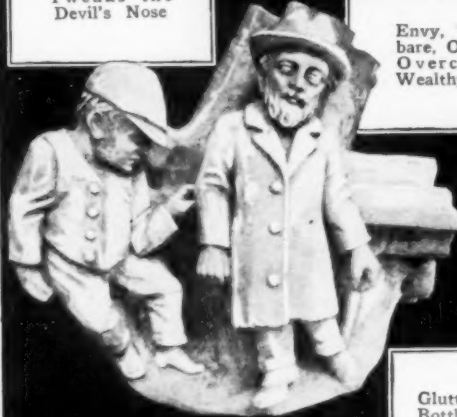


St. Dunstan
Tweaks the
Devil's Nose

Anger Beating
against Stone
from Which He
Is Modeled



Envy, Thread-
bare, Ogles the
Overcoat of a
Wealthy Citizen



Gluttony, with
Bottle Clutched
in Fist, Gnaws
a Ham Bone



Pride Caught in the Midst of His
Tumble, One of the Washington Ca-
thedral Carvings



The Lion of Judah, Symbolic of Spir-
itual Strength, Is Another of the
Thousand Odd Vaulting Bosses

GRAPHITE FOR PISTON IN RING

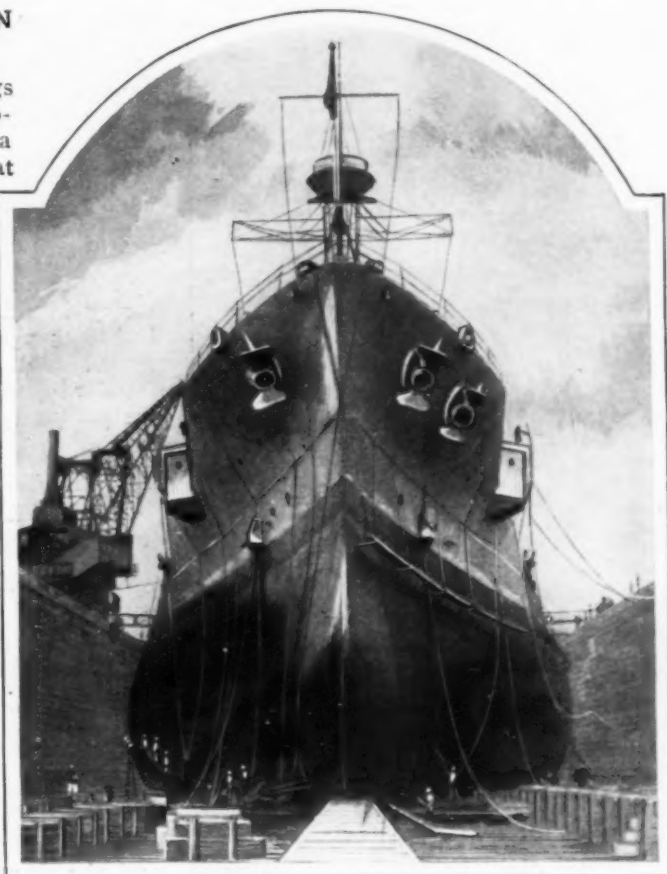
Self-lubricating piston rings have recently been introduced in the form of a unit with a groove that carries a supply of a graphite mixture. This is said to greatly increase the life of the piston ring. The graphite material is a specially prepared compound to yield the best results under all conditions and to remain in the groove indefinitely.

AUTO DIAL TELLS BRAKE POWER

For the motorist who desires to know more exactly how his car is performing with respect to maximum net pull, pulling power at thirty miles an hour, frictional losses and other important details, a simple meter has been devised. It is set in the dash or on the steering post, has no outside connections and registers the results on a dial. After proper adjustment, it will enable the driver to measure the grade, either up or down, over which he is passing. It can be used to test the brakes, an acceleration test indicates a possible faulty carburetor adjustment that may be corrected, and other revealing tests can be made. One of the most important is the maximum net-pull test. The pull comes just before a change to second gear is necessary and occurs in most cars between the speeds of from twelve to twenty-five miles an hour. This forms a rating basis on which to compare the performance of other cars.



☛ Venus is about the size of the earth.



Battleship "Utah" in Drydock Where Blisters Were Welded to the Hull to Protect the Vessel from Torpedoes

WELD BLISTERS ON BATTLESHIP TO ABSORB SHOCKS

To reduce the force of mine and other explosions against the sides of the ships, the sister dreadnaughts "Florida" and "Utah" are being equipped with shock absorbers or "blisters." These are welded to the hulls as additional armor protection against torpedoes.

AN INSECT ZOO

Insects, lizards and many kinds of reptiles are on exhibition under conditions closely resembling their natural habitats in the Jardin des Plantes, Paris. Miniature forests, inclosed in glass, afford natural living surroundings and spectators may see them at work. The "zoo" is a fulfillment of the wish of Jean Henri Fabre.



Nursing-Bottle Holder Attached to the Carriage in Convenient Position; It May Also Hold Toys

HOLDER FOR NURSING BOTTLE PREVENTS BREAKAGE

To keep the nursing bottle in position, a convenient holder that may be attached to the crib, high chair or baby carriage has been introduced. It prevents the infant from dropping the bottle, makes it unnecessary to prop up the coverlets to hold it in place, and the child can readjust the bottle without assistance, should it slip away a slight distance. When the bottle is removed, the holder may also be used to support toys and playthings.

AID RAIL TRAVEL IN AUSTRALIA WITH UNIFORM GAUGE

To reach Perth from Sydney, Australia, a passenger by rail must change trains six times and travel on the systems of five states. Part of this difficulty has been due to the fact that the route includes railroads of three different gauges, but this feature will be eliminated when the proposed uniform-gauge, the standard four feet eight and one-half-inch width, is built across the continent. Part of the road has been completed and, last November, the first trains were run over the new line from Sydney to Broken Hill. A

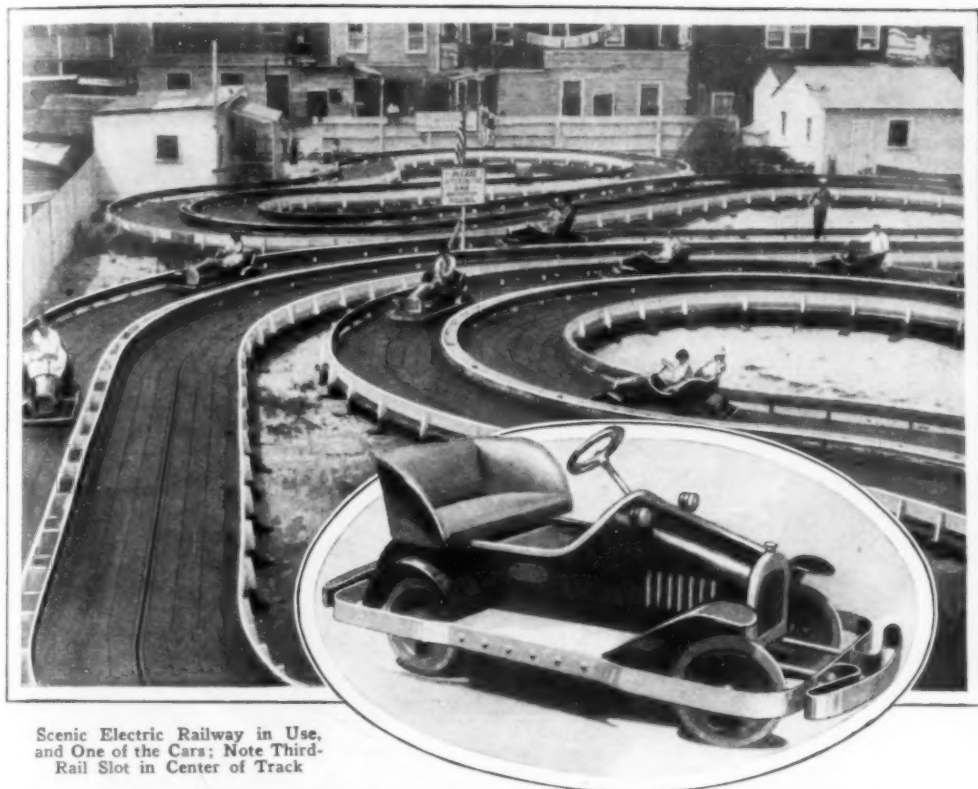
bridge over the river Darling is one of the important units of the road. It is of the bascule type and has a highway for vehicles as well as space for the trains. It had to be constructed to allow for the sudden rise of the river after floods. In dry seasons, the stream will scarcely float a child's boat, but it becomes a torrent after heavy rains. The line shortens the distance between Sydney and Broken Hill by 709 miles and effects a corresponding saving in time, as, formerly, passengers had to change trains four times. It is expected that completion of the entire standard-gauge road will greatly increase the prosperity of the country as a whole.

SCREWDRIVER HOLDS SCREW WHILE STARTING IT

A screwdriver which holds the screw while starting it, but which can be used, if desired, in the ordinary way, is the invention of a Chicago man. A sleeve fitting over the driver operates a pair of jaws that catch the screw after its slot has been placed on the tip of the driver. When not in use the sleeve can be drawn back, bringing the jaws behind the point of the driver, and permitting its use as a normal tool. Either round or flat-head screws, of either wood or machine type, are held, and the drivers, in various sizes, take everything from small jewelers' screws up to the largest sizes.



Screwdriver That Holds the Screw, and, Inset, a Close-up of the Jaws Which Do the Work



Scenic Electric Railway in Use,
and One of the Cars; Note Third-
Rail Slot in Center of Track

JOY RIDERS DRIVE OWN CARS ON PARK TWISTER

Thrills of riding on a twisting electric railway at Coney Island are increased because patrons have the pleasure of driving their own cars. The system is of the third-rail variety. In this case, the current conductor is in a center slot where it is safely out of the way. Contact is made through a sliding "dog" connected to the underside of the car. Each unit has a starter operated by the foot. Pressing the switch starts the car and releasing, stops it. The course is nearly 1,000 feet long and has a number of sharp turns.

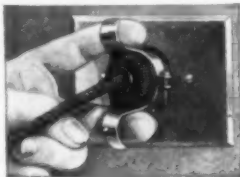
THRILLS IN TABLE FIREWORKS

Fireworks which can be set off on the dinner table is the latest party surprise imported from Germany. An explosive cap in the base, touched off by lighting a fuse, projects the contents of the pieces into the air. Most of the pieces range from two to four inches high, and to discharge them

it is only necessary to place them on a plate and touch a match to the fuse. One, decorated in red, white and blue, throws a number of small American flags into the air. Others discharge paper dolls, small animal favors, flowers, confetti, and even a complete deck of cards.

SHIELD FOR ELECTRIC PLUGS PREVENTS FRAYED WIRES

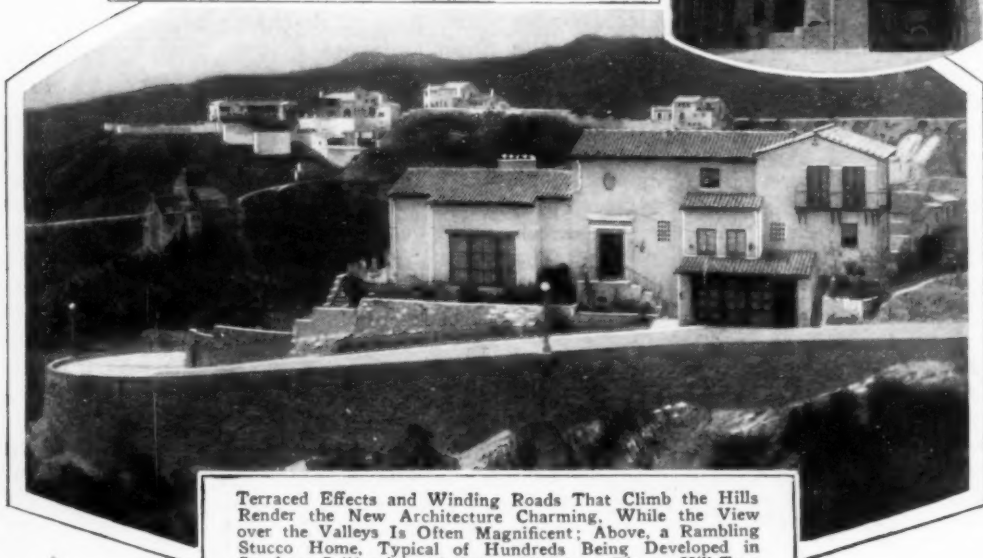
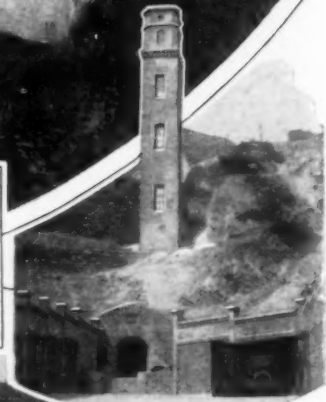
Successive pulling and inserting of the plug on the extension electric cord is likely to fray the wires in time and so lead to possible short circuits or fires. This danger is said to have been eliminated by a clamp which is quickly attached to the plug and has convenient finger brackets to simplify the task of removing the plug. The pull is exerted on the clamp and not on the wire, saving the latter from unnecessary wear.



TRANSFORMING UNSIGHTLY HILLS INTO HOME SITES



Los Angeles and Other Southern California Cities Are Developing a Distinctive Type of Hillside Architecture That Resembles the Charming Effects of Old-World Towns; Above Is a Typical Terraced Hillside Home, with the Automobile Road Entering above the House Top; at the Right, Garages at the Foot of the Hill and an Elevator Built in an Ornamental Tower to Lift Residents to the House Level



Terraced Effects and Winding Roads That Climb the Hills Render the New Architecture Charming. While the View over the Valleys Is Often Magnificent; Above, a Rambling Stucco Home, Typical of Hundreds Being Developed in Southern California, with Others Visible on Distant Hill Tops

SENTRIES GUARD RADIUM MINE IN AFRICA

Few plots of ground are more carefully watched than an area in Central Africa where Belgian interests own a large tract of radium-bearing rock. Armed sentries are on guard every day and night of the year, lines of tangled barbed wire, similar to those used in the war, surround the district and, except those employed, few persons are ever allowed to handle the precious materials being mined. Every piece of radium rock is carefully checked up as it leaves in sealed trucks to be shipped to the extraction works. Only a few museums have been given specimens from the deposits.

VOICE TESTER SHOWS IF SINGER IS SUITED FOR THE STAGE

Under the misguided impression that they may become concert or opera singers, many persons with excellent voices are spending large sums of money and valuable time in cultivating their talents in that direction, although their efforts are almost sure to fail. The reason is that, though their voices have splendid quality, they lack sufficient volume, range and other essentials necessary for the stage. To reveal the true nature of the voice and prevent a singer choosing a career to which he is essentially unsuited, a Hungarian vocalist has devised a voice tester. It is said to register and indicate the tones with respect to volume and range especially, and the results are held as a fair index of the singer's vocal equipment, whether it would justify training for the operatic platform or not.



Learning the Fine Arts of Milking at the Canvas Udders; One of the Lessons at English Dairy School

DAIRY SCHOOL'S CANVAS "COWS" AID IN MILKING LESSONS

Men and boys in England who seek positions on farms in Canada, are often given special training before they go, so that they will be able to start their work without the handicap of inexperience. In one preparatory "school" for prospective dairymen, milking instruction is given with the aid of canvas udders. The lessons teach the correct hand positions and other details essential to a successful milker.

SEEDLESS TOMATOES

A variety of seedless tomato has been produced, after five years of experimenting, by a Kansas man. One of the vines is thirty-seven feet long and the largest tomato it yielded weighed just an ounce less than four pounds. The grower declares that he is

not satisfied with his product, as he wants to cultivate one that is sweeter and smoother. He said that he had once grown a seedless watermelon, but that the short season in which the crop can be produced forbade a development of it at a profit.



Registering His Voice on Tester Which Is Intended to Show Singer's Possible Fitness for Stage



Harmonica Horn with Its Reed-Chamber Mouthpiece;
It Produces the Tones of a Double-Bass Tuba

BIG HORN LIKE A HARMONICA IS EASILY PLAYED

Said to be more easily played than a double-bass horn, but serving much the same purpose as that instrument in an orchestra, a large-size harmonica unit has been introduced. Its music is produced by two series of reeds, set in chambers like those of the ordinary harmonica. The horn serves as an amplifier for the tones, and the instrument is played by blowing instead of alternately blowing and drawing in the breath, as is the case with a mouth organ.

CARRIER TELEPHONE RESTORES FLOOD-BROKEN WIRES

Faced with the worst disaster in its history when New England was recently swept by floods, the telephone company broke all records in restoring service by installing carrier-current phones on some of its principal lines. These phones are a form of wired wireless, in which the conversation impulses are converted into radio waves and dispatched along the existing telephone wires. They supplement

the capacity of the wires, providing additional talking channels without the expense of stringing extra wires, but, more important still, they will jump breaks in the wires, follow them when they have been torn down by storms, and even pass through when the pole lines have been submerged by flood. The New England Telephone company had ordered ten carrier-current outfits, to be delivered next summer, but when the flood came a California company heeded an SOS from New England, waived delivery on equipment which had been built for it, and allowed it to be sent to the flood district. The deal was arranged by long-distance telephone at noon on Nov. 11, drawings were shipped by air mail from Chicago that night, and the machinery started the same day by express, the first lot reaching Boston on the fourteenth.

RUBBER BULB BREAKS-IN PIPE AND HELPS CLEAN IT

Breaking-in a new pipe is usually an unpleasant process, but most of the difficulties are said to have been removed with the aid of a small rubber bulb and tube arrangement, which accomplishes in a few moments what a smoker generally would not attempt to do in less than a day or so. The tube is attached to the stem, the tobacco lighted and the bulb pressed at rapid intervals, the bellows and suction action drawing the smoke out rapidly and giving the pipe the equivalent of actual use. After consuming an ounce of tobacco in this way, the pipe is usually



Pipe-Breaker Bulb in Action; Fumes Are Sucked Out
to Rear of Ball and Help Clean the Pipe

ready for the smoker. To clean the pipe, the cake is thoroughly scraped out, a filling put in and smoked rapidly with the bulb. The heat generated usually leaves the bowl sweet and dry. Many pipe experts agree that neither bowl nor stem should be washed or any liquids applied.



Blowing Up the Rubber Boat to Give the Motorcycle a Ride; the Collapsible Floats Have Been Found Increasingly Useful in the French Army, Where Special Development of the Motorcycle Is under Way

RUBBER BOAT FOR MOTORCYCLE LATEST ARMY AID

Motorcycles have become increasingly useful for army service and are now made all the more effective by the introduction of rubber boats on which they can be floated across streams and other bodies of water. The boats are somewhat similar to those used for life-saving purposes and can be quickly inflated.

"FOUR-IN-ROW" CHECKER GAME TESTS PLAYERS' WITS

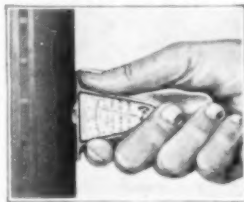
Checker players are reviving a game that was popular fifty years or so ago, an interesting adaptation of "tick tack too," the familiar paper or blackboard game. The object of the game is to place four men in a row, vertically, diagonally or horizontally. The colored squares of the board are used, each player placing a man alternately. By careful blocking, an opponent can prevent his rival from doing this, even

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32

though he has the advantage of the first move. The board is used in the chess position with a white square at the lower right-hand corner.

PINCH TELLS TIRE PRESSURE WITHOUT TOUCHING VALVE

By pinching a balloon tire, the motorist can tell with fair accuracy if it needs inflating, and now the pinching process has been adapted to a pressure gauge which gives a reliable report of the tire's contents without removing the valve cap. The instrument is pressed against the wall of the tire at the side. In doing so, an extension plug which works against a stiff spring in the tester, depresses the tire more or less, according to the air pressure within, and the degree to which the tire opposes this depression is registered on a dial, giving the equivalent of the air pressure in pounds. The device slips into a small holder that can be carried in the pocket and five tires can be tested in about half a minute.



Two Pounds



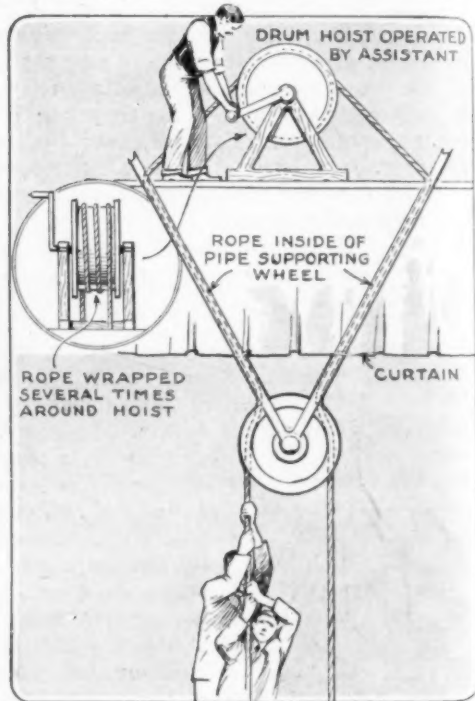
YOU'VE all seen it: The 200-pound man trying mightily, but all in vain, to lift the 110-pound lady from the floor.

You've all heard it: The disgruntled remark of the 200-pound man as he left the stage, neck bulging and forehead beaded:

"Whew! Just ... two pounds ... less than an elephant!"

And the little lady smiles, receives her \$300 per week, and enjoys the awed plaudits of the public. And the public is entertained and mystified. And backstage, a group of cynical stagehands eye each other knowingly and whisper "applesauce" after the act is all over.

The first acts of this type, notably that of Miss Lulu Hurst, the "Georgia Wonder," were, on the whole, quite legitimate, the various effects being based almost exclusively on the pivot-and-fulcrum theorem of physics. But the majority of weight-lifting acts today are largely faked, and



One Small Miss Can Lift a Flock of Weighty Men into the Air. When the Rope of Her Trapeze Swing Is Rigged as Shown in the Diagram; a Stage Hand Does the Real Work

Less Than an Elephant

what was once a scientific demonstration, even to stagehands, has now come to be labeled as "a lotta applesauce."

One of the best examples of this pseudo-weight-lifting is the "Swing Lift." In this effect, recently rather popular, the only visible equipment is a fifty-foot length of rope, which runs from the floor of the stage, up through a large wooden wheel suspended from the flies, and then back to the floor again. One end of the rope is looped together to form a swinging seat; the other end hangs free.

The performer, after giving a short demonstration of body lifts and similar experiments, seats herself in the swing. Her stage manager then invites several husky men to come up on the stage. They come—muscular well-built men, aggregating a total weight of at least 700 pounds. They are requested to take the free end of the rope and pull.

"All together now!"

Up goes the 110-pound lady into the air. Easy! And then the 110-pound lady begins to take on weight. You see her body tense as she applies her "uncanny magnetic force." You see the wheel begin to revolve slowly. You see the five men clutch wildly at the rope. The wheel turns faster. And the young lady is down on the stage, while the five-man ballast is left suspended in mid-air. Seven hundred pounds of baffled manhood leaves the stage. One of them usually grunts:

"Whew! Just...two...pounds...less than an elephant!"

The explanation of this effect is quite



It Looks Hard, But If the Sitter Is Rigid, a Twenty-Pound Push on the Chair Back Apparently Lifts Him

simple, as the sketch will show. The rope, instead of running up around the wheel and back to the floor, as is generally supposed, really runs up to the wheel, then up one of the pipes which support the wheel, around a drum hoist concealed in the flies, back down another of the pipes, onto the wheel again, and down to the committee of men on the stage.

An assistant operates the hoist. Without his hand on the lever, the rope plays back and forth quite freely. On the signal from the stage manager, however, he rests a "magical" hand on the hoist, gives the crank a few turns, and—presto!—down goes the 110-pound lady; up comes the 700 pounds of bewildered masculinity. Then the rope is allowed to go completely through the wheel and fall in a pile on the stage floor—mute evidence that the whole effect was absolutely "on the square."

The illusion just described is usually the feature of a modern weight-lifting act. As a preliminary, the performer invariably



presents a few carefully selected experiments of a similar nature in order to subtly mold the minds of her audience into a receptive state for her concluding effect.

Most of these preliminary experiments require considerable practice for their successful demonstration, but there are many striking effects in this field which can be easily duplicated by anyone. One of the best of these is the "Chair Lift."

Try to imagine the effect for yourself. Suppose you were the girl shown in the picture. Do you think that you could lift the chair on which the man is seated, completely free of the floor, without any great physical exertion on your part? It doesn't seem altogether feasible, does it? Yet the trick can be done, as shown in an accompanying picture, with a minimum amount of physical strength.

Let me explain: The person seated in the chair must be instructed in three very essential requirements, as follows:

1. He must keep his feet firmly on the floor.

2. He must grip the chair seat firmly.
3. He must hold his body, arms and legs absolutely rigid.

That's all there is to it! If you will rest your hands on the back of the chair and press straight forward, not attempting to lift the chair at all, you will find that a push of about twenty pounds will elevate the chair several inches.

Considering still simpler, but none the less effective and mystifying tricks of this nature, we come to the "Finger Snap." In this experiment you ask the biggest man in your audience to place his two fists together, one on top of the other, as shown in the picture. He is somewhat surprised when you knock his fists apart by simply

snapping your two index fingers against his hands. And, paradoxical as it may seem, the tighter the strong man holds, the easier his fists will fly apart.

Try this one: Place your two forefingers together in front of your body, as demonstrated by the girl



The Five-Finger Lift. Top, and Bottom. How to Defeat a Lifter Who Could Easily Raise the Weight by the Method Shown in the Center



The Whole Crowd Can't Force Your Body against the Wall When You Stand as the Girl Does Above

in the accompanying illustration. You will find that you can successfully resist the efforts of the strongest man to pull them apart. The only conditions imposed on the "puller" is that he stand squarely in front of you, and that he pull steadily in a lateral direction. Your job is to press your fingers together as tightly as possible.

A parallel to the preceding effect is found in the "Hand on Head Lift," which also is illustrated. With her hand pressed firmly down on her head in the manner shown, the girl subject can easily resist the effort of any single person to raise her hand from her head.

An effect which demonstrates the power latent in a single finger is known as the "Five-Finger Lift." In this effect, four men, using a combined lifting power of five fingers, easily lift a 130-pound woman several inches from the floor. All that is necessary is that they place their fingers at the points indicated in the picture and lift in unison. Up she goes!

A test made famous by Annie Abbott, known as the "Press to the Wall," can be successfully duplicated by any athletic young woman. In this test the subject



Clenched Wrists Can't Be Held Together When Extended Forefingers Are Snapped against Them, as Shown in the Pictures Above



takes her place as shown in the illustration. By making her arms and body perfectly rigid she can easily resist the combined forces of five or six men trying to press her to the wall. As many as twenty-five or thirty men have been used in this effect for stage presentation; the resisting power of the woman is astounding.

Still coming in for a considerable share of the glory in the average weight-lifting act is the simple "Body Lift." In this lift the performer demonstrates that he (or she) cannot be lifted when he "so wills it" by even the most powerful man. The body lift is a perfectly legitimate piece of science, and although it is not so easy of duplication as the preceding experiments, it is quite possible for practically anyone to develop sufficient technique to defy the efforts of any but the strongest men.

Figures on page 404 illustrate this lift. The center picture shows the position in which the lift can be successfully made. Notice that the lifter can stand close in and erect. The lower figure shows the

young lady defying the efforts of the man to raise her from the floor. The position is the whole thing. Notice that the hand on the wrist and the hand on the jugular-vein region of the neck force the lifter to assume a semi-crouched position, at arm's length from the subject. In such a position his lifting strength is practically nil, since the position which he must assume gives him virtually no leverage with which to carry a weight upward.

Another straight lift defies the combined

muscular strength of four men. In this test, the lifters raise the subject by grasping her under the elbows and hands as shown on this page. You will note that, when the lift is allowed, the subject holds her elbows close to her body and tenses her shoulder muscles. To prevent the lift, she allows her elbows to hang loosely, away from her body, while



It Is Impossible to Lift the Hand from the Girl's Head. Top; Center, Four Men Can't Lift a Girl Whose Arms Are Relaxed, While Two Do It Easily, Below

her shoulder muscles are completely relaxed. Such a posture on her part forces the lifters down into a semi-crouch position where they can exert but little direct pressure upward.

A peculiar stunt, and one which was used during the war as one of the tests given aviators, involves the reflex action of the muscles, although it isn't in any way a "strong man" stunt. The trick is to stand near the wall or some other solid object and press the back of the hand tightly against the wall, holding it there, with all the pressure the arm muscles can exert, for a minute or more. Then allow the arm to drop to the side. Immediately the hand, of

its own volition, will be drawn back toward the wall just as a metal pendulum might be drawn by a powerful electric magnet. The pressure exerted during the minute the hand is in contact with the wall cramps the muscles in that position, so they seek to return to it again.

The principles involved in many of the strong-man stunts on the stage have very practical applications in ordinary life. Take weight lifting, for example. The same method that makes it easy to pick up a person should be applied lifting a heavy weight, a wheelbarrow, for example. The workman who bends over from the waist and picks up the wheelbarrow handles is throwing all the burden on his back muscles, and may strain them seriously. If he bends at the knees,

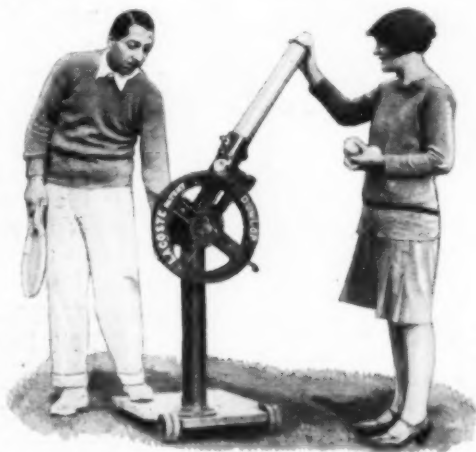


Try Pulling a Friend's Extended Forefingers Apart After the Tips Have Been Pressed Firmly Together

then lifts the handles as he straightens up, the much more powerful leg muscles do the work and the strain on the arms is down from the shoulders.

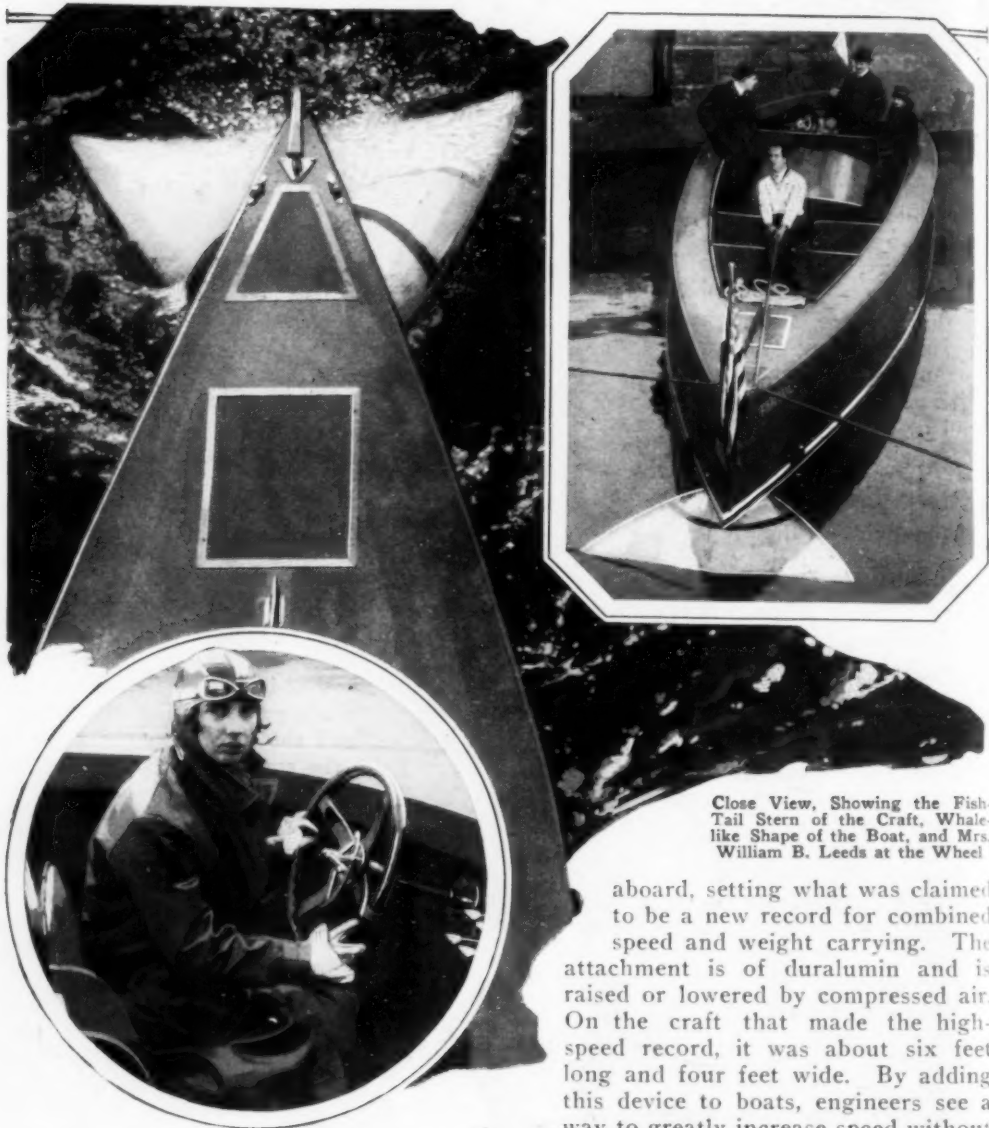
"SILENT PARTNER" FOR TENNIS HELPS DEVELOP SKILL

Rene Lacoste, French tennis star, owes some of his cunning with the racket to a contrivance of his own invention, an apparatus that hurls the balls at him from the other side of the net and from various angles so that he can practice difficult shots. The outfit may be operated by an electric motor or by turning a hand crank and is adjusted to develop strokes that would be required only in playing against a skilled opponent.



Loading the Tennis "Gun"; Lacoste Is Seen Supervising the Operation; He Devised the Unit

FISH TAIL ON BOAT PROMISES GREATER SPEED



Close View, Showing the Fish-Tail Stern of the Craft, Whale-like Shape of the Boat, and Mrs. William B. Leeds at the Wheel

Faster motor craft for sport, business and war are promised in the application of an interesting unit to the stern. It is shaped like a fish's tail and serves about the same purpose on a boat as the lateral controls on an airplane. It enables the craft to skim across the water instead of cutting through it. In a recent test, a motorboat so equipped raced across Long Island sound at a speed of more than a mile a minute with twenty-four persons

aboard, setting what was claimed to be a new record for combined speed and weight carrying. The attachment is of duralumin and is raised or lowered by compressed air. On the craft that made the high-speed record, it was about six feet long and four feet wide. By adding this device to boats, engineers see a way to greatly increase speed without amplifying the motor power, and it is believed that it is also suitable for use on torpedo boats and other small naval craft.

AMERICAN GOLD SENT ABROAD FIRST TIME SINCE WAR

A million dollars in gold coins, packed away in stout kegs in the treasure vault of the "Aquitania," sailed out of New York harbor recently, bound for England. That was the first time since the early

days of the war that Great Britain had received gold coins from this side of the Atlantic. For thirteen years the movement had all been from east to west. Gold is shipped whenever the value of the exchange bills of one country rises enough above par to offset the shipping charges, insurance and loss of interest on the money itself while in transit. To ship gold from New York to London at a profit, it is necessary for English bills of exchange to be quoted in New York at two and one-tenth cents above par for the pound, in other words at $\$4.88\frac{3}{4}$ for the English pound, par for which is $\$4.8665$. When the million in gold was shipped recently, the pound was not quite that high, being a half cent below the mark, but the prestige of being the first to ship gold eastward across the sea in thirteen years apparently offset the slight loss. Several million dollars in gold recently was shipped to South America, the two consignments being the first to tap America's great war-time hoard of gold, which reached $\$4,500,000,000$, or about forty per cent of the total supply of the world.

DUSTLESS FURNACE ASH PIT HELPS SAVE COAL

The unpleasant task of removing ashes from the furnace has been simplified by a pit and bucket arrangement, easily installed and designed to save coal and protect the grates. The pit is at the rear of the furnace and holds the bucket which has a handle at the top. Ashes are simply scraped back into the container through a chute and the bucket is lifted out for dumping. By this method, no dust can escape into the furnace room, the draft is improved and there is no danger of dropping live coals on the floor while emptying the ashes. The bucket fits tightly against the sides of the pit.



Drawing of Ash-Pit Installation, Showing Ease of Disposal of Ashes without Dust



Testing Auto's Exhaust Fumes, to Determine if the Carburetor Has Been Adjusted Properly

TESTING AUTO EXHAUST GAS HELPS SAVE FUEL

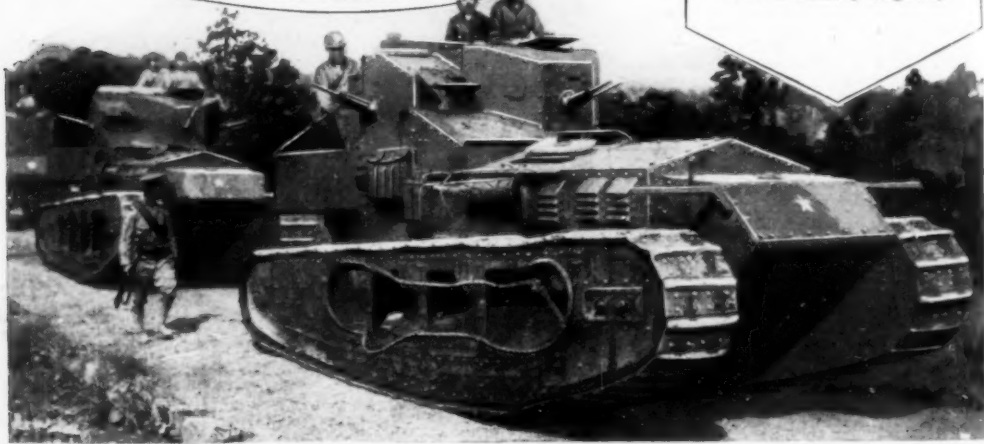
As an improvement over the usual method of adjusting the carburetor, a process has been developed that makes use of a simple testing apparatus to examine the exhaust from the motor and so tell accurately if the proper combustion has been effected. It is similar in some respects to the outfit used in making an analysis of flue gases in steam-generating plants. The auto-exhaust tester gives an exact measure of the amount of carbon dioxide in a sample of the gas, so that adjustments of the carburetor can be made until the proper amount is registered. But little skill is necessary in operating the tester.

Interior photographs are being made with the welding arc.

JAPAN DRILLS ARMY TO USE LATEST WEAPONS



Lessons of the World War, Reflected in the Latest Types of Weapons, Were Taught in the Recent Maneuvers of the Japanese Army, Held in the Shadow of the Sacred Mountain Fujiyama; Above Is a Heavy Field Gun Covered with a Protective Net, on Which Branches Can Be Thrown to Defeat the Eyes of Prowling Airmen; at the Left Is a Light-Machine-Gun Party Advancing into the Open with Wisps of Rice Straw Used for Camouflage; Below, a Group of the Latest-Model Armored Tanks Advancing down a Country Highway



SUN HEATS WATER FOR HOME

Successful utilization of the sun's rays to heat water for home use, has been accomplished, it is reported, with a simple coil installation a western company has introduced. In sections favored with sunshine most of the year, the system is said to be effective during eight of the twelve months and stores sufficient hot water for night consumption. If desired, a gas-burning heater may be added to the outfit to supplement the sun during times of cold or cloudy weather in winter. A glass-covered, shallow box, containing sheets of copper and coils of pipe that lead to a storage tank, is an essential part of the apparatus. These coils hold a mild solution of alcohol and water, which is kept in circulation by the normal action of heating and cooling, and distributes their heat to warm the water in other pipes within the insulated storage tank. The liquid in the coils is never used, merely serving as the heating medium. The "window box" and pipe coils may be installed in almost any position where exposure to the sun is assured. Some users adapt it to the roof of the house or the garage, as an awning over a back porch or as part of a pergola. At an army balloon school in Arcadia, Calif., it is placed on the ground. After the installation, there is practically no maintenance expense.



Where Autos Will Pass through a Skyscraper; One of the Drives That Leads into the Huge Building as It Appeared under Construction

AUTO ROAD THROUGH BUILDING HELPS RELIEVE CONGESTION

Instead of having to go around the structure, autoists will be able to drive through the thirty-two-story Grand Central skyscraper being erected in New York city, for a roadway is laid directly through the center of the building. It is one story above the street level and leads into the recently improved Park avenue. Two viaducts join and pass through the building. Cars pass to the street levels on ramps.



Water-Heating Plant That Utilizes the Sun; the Storage Tank Is Seen in Background at Right



Drawing of the Lenses in Actual Use; Focusing Is Accomplished by Moving the Larger Glass Backward or Forward

VEST-POCKET TELESCOPE SET HELPS HUNTER AND HIKER

As a substitute for the ordinary binoculars or field glasses, a pair of lenses that fits in a small case for the vest pocket, has been introduced. To use them, the smaller is held close to the eye and the larger about at arm's length. Focusing is done by moving this larger glass backward or forward. The magnifying power is more than five diameters, adjustment is quickly accomplished, and the bother of a heavier instrument avoided.

BUREAU HANDLES PHONE CALLS FOR ABSENT SUBSCRIBER

At small cost, telephone subscribers in Paris may have the service of a central bureau to handle their calls when they are away from home or office. The exchange is notified when the person leaves, and his line is plugged in at the main office. Calls are received there and are relayed by wire or letter to the subscriber when he notifies the office that he has returned. Messages may also be given to persons who call.



Receiver That Lights Lamps by Sound

FLOODS CAUSE FIRES

It seems a paradox that waters of a flood may prove the direct cause of serious fires, but such was the case after the recent high waters in Vermont. Fires were caused in barns because the hay absorbed water with the result that spontaneous combustion followed. The damp hay passes through a "heating" stage, due to the slow but steady absorption of oxygen which

causes oxidation of the entire mass when conditions are suitable. In many cases, owners found it necessary to remove hay from the barns to prevent an outbreak of fire. Spontaneous combustion is one of the most common causes of blazes. It is frequently the result of piling oil or paint-soaked rags where the heat is stored up and increases. Coal is often ignited by heat developed in the pile.

SOUND OF PLANE LIGHTS LAMPS ON LANDING FIELD

Practical use of the grid glow tube has been made in an apparatus for lighting the electric lamps of an airport by the whirl of the airplane's motor. With this outfit, a pilot, 1,000 feet or more above the field, may be able to make a safe descent under difficult conditions, as the lights burst forth without the touch of human hand. A microphone picks up the whirl of the motor. These sound vibrations are transferred in such a way to the sensitive tube that it relays an electric current through switches that turn on the lights. The unit would reduce waste of electricity at airports.



Typical Homestead on the Bitterroot National Forest in Montana; the United States Still Has Many Million Acres of Public Domain Open for Settlement by Pioneers

NEARLY two hundred million acres in the west and almost twice that much in Alaska remain of Uncle Sam's public domain, to be given away some day if settlers can be found who want it. Although thirty-nine years have passed since the greatest land rush in history, when Oklahoma was opened and settled in a single day, the public land-office figures show the government is far from being without open land for new citizens.

The drawback, however, is that the bulk of the land left represents the parts that have been passed over by settlers as undesirable, or claims which were once settled and then abandoned because they would not support the settler.

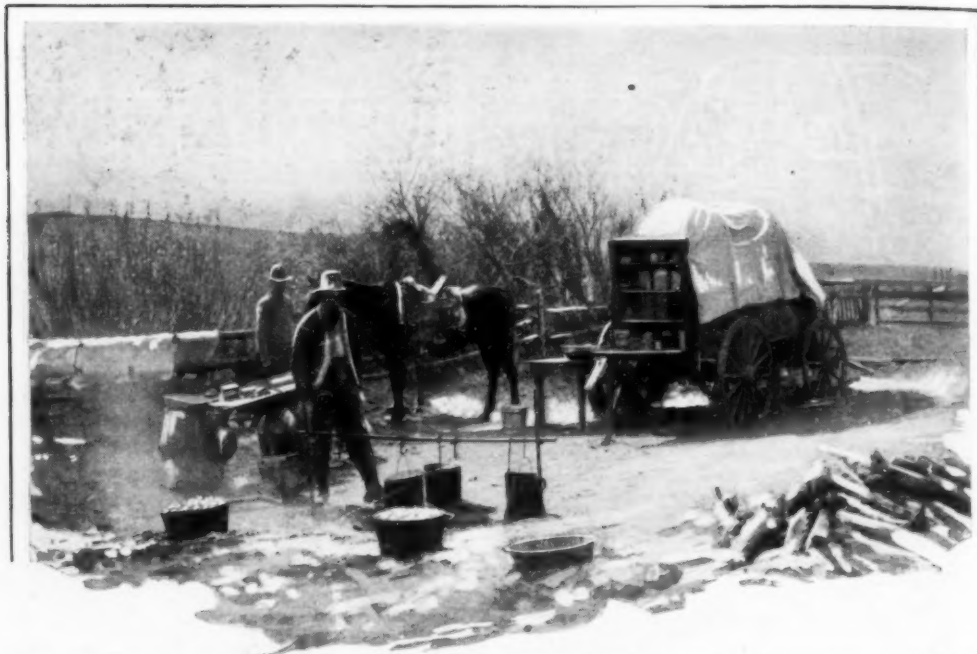
Some tillable areas can still be found, but most of the 196,056,747 acres, or at least that part of it which has been surveyed and so rendered open to settlement, is suitable for nothing but grazing land. There are still 56,919,013 acres remaining to be surveyed in the United States, while the larger part of the 376,165,760 acres of government land in Alaska has never been surveyed.

Most of the public domain left within

the states is concentrated in Utah, California, Wyoming, Arizona, New Mexico and Idaho, with occasional small parcels here and there in Kansas, Michigan, Mississippi and Wisconsin.

The gradual elimination of the old free west, when the cattle of the ranch barons roamed a thousand hillsides, will prevent any repetition of the spectacular scenes that marked the settlement of Indian territory, which later became the state of Oklahoma. The government itself barred further land rushes when it substituted the lottery system now used to dispose of desirable new parcels of public land. All the would-be settlers file their names and addresses in sealed envelopes, and on a given day they are drawn by lot, each in turn getting a numbered claim. The lotteries, however, apply only to the opening of entire new tracts following survey. Any of the surveyed and unsettled domain can be taken up at any time, 320 acres of non-irrigable and non-timbered land for dry farming, or 640 acres of grazing land for stock raising.

After the settler has picked the place he wants to live, he settles on the land, and



Chuck Wagon and Camp at the Beef Roundup of the Querna Verda Live-Stock Association on the San Isabel National Forest, Colorado; Grazing Is Permitted on the Forest Lands

must remain there at least seven months out of the year for three years. At least one-eighth of the land must be put into cultivation each year after the second until the time of final proof, and he must have a habitable house on the land at the time he receives his patent.

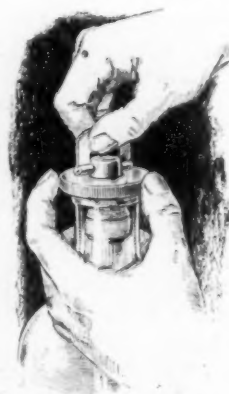
Under the old law, mineral lands were exempt from settlement and settlers lost their claims if minerals were found prior to the granting of the patent. That often worked a hardship, so, in 1909, the law was amended to permit issuing of patents, but reserving coal deposits to the government, no matter when found. In 1914, another law opened lands containing phosphates, nitrate, potash, oil, gas and asphaltic minerals, with the deposits reserved for the nation. All mineral findings are reserved when grazing-land patents are granted.

BIG INCREASE IN CANARY-BIRD IMPORTS TO U. S

Four times as many canary birds were imported last year as in 1922, according to reports from the department of commerce. Of the 556,417 birds arriving from

foreign countries, 374,895 were canaries. The mounting popularity of the songsters is believed partly due to improvements in their cages. These objects are more ornamental than formerly and, because of their efficient construction, are believed to make the birds feel more at home and so stimulate them to sing.

EXPANDING CORK FOR BOTTLES FITS DIFFERENT SIZES



pressure is applied evenly. To remove the cork, the key is simply turned in a reverse

Suitable to bottles of different sizes, a stopper now on the market consists of a turning key that twists a little sliding plunger below against a rubber washer until it fits tightly against the neck of the bottle. Since the washer is soft, there is little danger of breaking the glass and pres-

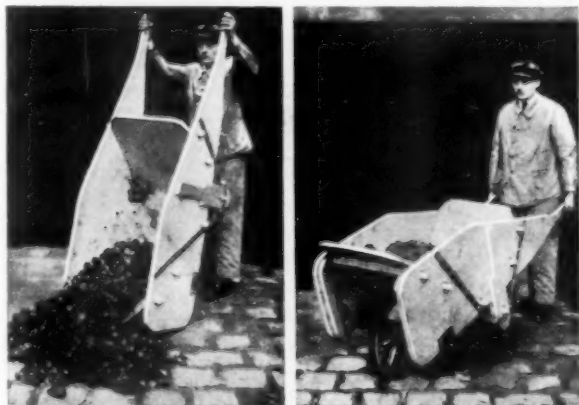
direction. Some of the stoppers of this kind are fitted with keys that can be removed so that the bottle is securely locked against opening by accident.

OX TEAMS SUPPLANT ENGINES FOR SWITCHING CARS

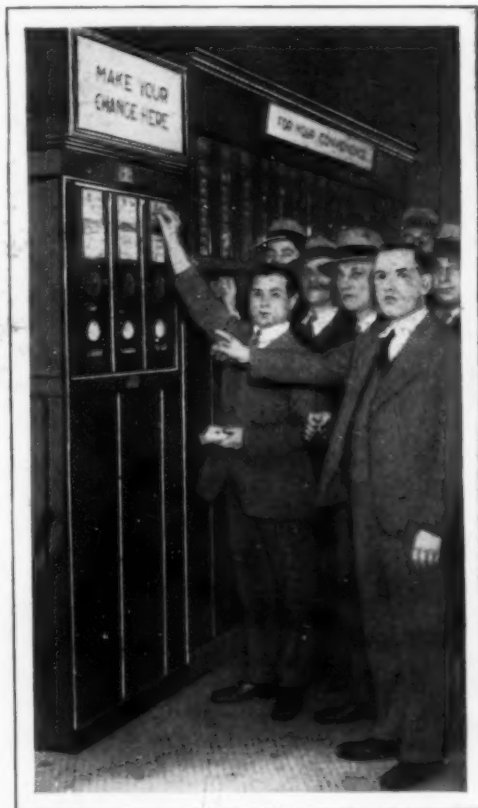
Oxen, a principal form of motive power centuries ago, are linked with modern industry in Navasota, Tex., where the animals are used to switch cars at a cottonseed mill. It was found that the long delays in waiting for the locomotives to do the task were too expensive, so the oxen were tried as a substitute and proved satisfactory. Six can pull more than 200,000 pounds on the rails. One yoke, recently sold, could handle a box car alone. Large Texas steers with long horns are used and appear to thrive at their labor. They are fed cottonseed meal and become sleek and fat. An experienced driver is required to handle them.

EASY-TO-EMPTY WHEELBARROW NEEDS NO BLOCKING

In emptying many wheelbarrows, the wheel has to be blocked, if on a slight downgrade, or it is difficult to throw the handles up. These obstacles are said to have been overcome in a barrow introduced in France. It is designed especially for heavy loads, the wheel being set far back and the ends arranged so that they strike the ground when lifting, providing a fixed fulcrum.



Dumping the Wheelbarrow without Blocking, and Front View, Showing the Wheel Placed Far Back and the Roomy Body



Customers Eager to Try the Cigaret Slot Machine; It Distributes Various Brands and Boxes of Tobacco

SLOT MACHINE FOR CIGARETS DISTRIBUTES MATCHES TOO

Cigaret purchasers may obtain a packet of their favorite brand, a package of matches and a coupon just by dropping a coin in the slot of a rapid dispenser unit introduced in New York city. The outfit saves the clerks' time, takes up but little room in the store and affords display space for the goods.

CHINESE IMPORT BROKEN GLASS FOR NOVELTIES

In China, broken glass is valued by manufacturers who work it over into various kinds of novelties. Large quantities are being imported from the United States and almost all kinds of glass are salable, the white-bottle variety being the most desirable.



Pulverizing the Soil as It Is Plowed; Rotary Attachment on Tractor Unit at Purdue University

ROTARY PULVERIZER ON PLOW SAVES FARM WORK

Attached to the rear of the tractor plow, a rotary pulverizer, developed at Purdue university, has proved effective in refining the furrow slices for immediate planting, saving a separate harrowing. The turning blades beat the soil into fine particles, and the operation is said to add but little to the load on the tractor.

BETTER HEAT AND VENTILATION WITH FURNACE FAN

Easily fitted into the cold-air pipe of the hot-air furnace, an electric fan, supplied with current from a lighting socket, gives four complete changes of air to every room in the house each hour, thus promoting health and increasing the efficiency of the furnace. When not in operation, the fan folds up, giving full free-air capacity in the pipe for circula-



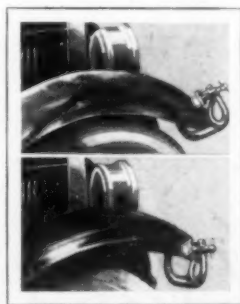
tion by gravity. As soon as the current is turned on, the blades are opened by centrifugal force.

RED WALLS FOR SMALLPOX PATIENTS URGED

Painting the walls of a smallpox patient's room red will aid recovery and reduce the chance of disfiguration through pitting, according to Prof. F. Gregoire, of Marquette university, Milwaukee, who has been making a study of the use of color in treating disease. The knowledge that red surroundings were of benefit in treating smallpox has been in existence ever since the time of the Roman empire, he says, but was lost to the modern world until recently. The rays thrown back by red walls ease the skin tension. Black and white, Prof. Gregoire says, are very depressing and should not be used extensively in hospitals because they tend to retard recovery. Tan and reddish colors as well as green tend to stimulate the patient's nervous system and hasten recuperation. Operating rooms, he says, should be painted green as the color relieves the surgeon's eyes and minimizes the chance of errors in operating.

ROLLERS TO IRON OUT FENDERS REDUCE REPAIR BILLS

Dents in the automobile fenders can be easily smoothed out by an amateur workman in his own garage, it is claimed, by the use of a large and a small roller recently introduced. One is for the rim and edge of the fender and the other, the larger, for the top. Pressure is applied by screwing down the upper wheel of the bracket. The roller is first run free over the fender, tilted slightly forward until the necessary pressure is obtained, and then passed over the dent with long easy strokes. If the kink or dent is deep and sharp, it is raised with a hammer before the rolling.



BATTLING THREE-YEAR PEAT FIRE IN SNOWSHOES



Snowshoes, oil-well pipe lines to carry sea water instead of oil, trenches filled with wet sand, and other unusual methods are being enlisted in Los Angeles to extinguish a peat-bog fire that has been burning for three years. The blaze is smoldering within the areas of an exclusive residential district and has threatened the destruction of homes

within sight of the city hall. Not long ago, three children became bogged in the area and were seriously burned, one fatally. The fire had spread over twelve acres at that time. City officials have estimated that it will cost at least \$14,000 to extinguish the fire which, in places, is burning between fifteen and thirty feet underground. To make a survey of the district, men at first attempted to walk about on foot, but the danger of sinking into the soft ashes and being burned was too great, so snowshoes were worn to support them. Trenches, ten feet deep, were dug in some parts of the area and pumped full of water. Chemicals have also been used. Drums of a fire-smothering substance are emptied into deep holes, and the resulting fumes have been effective in stopping the blaze. An electric line that runs through



Water Trench Dug to Curb Spread of Fire, a Warning Sign in Danger Area, and Crossing the Burning Tract on Snowshoes

the burning district has protected its tracks by digging deep trenches parallel to the right of way and filling them with wet sand. Arrangements have been made with an oil company to pipe sea water through its mains and flood the area, if necessary, to prevent the fire from undermining the residential territory near by. If the flooding scheme has to be carried out, it will require the construction of a dam around the entire twelve-acre plot and filling the inclosure with water to a depth of several feet.

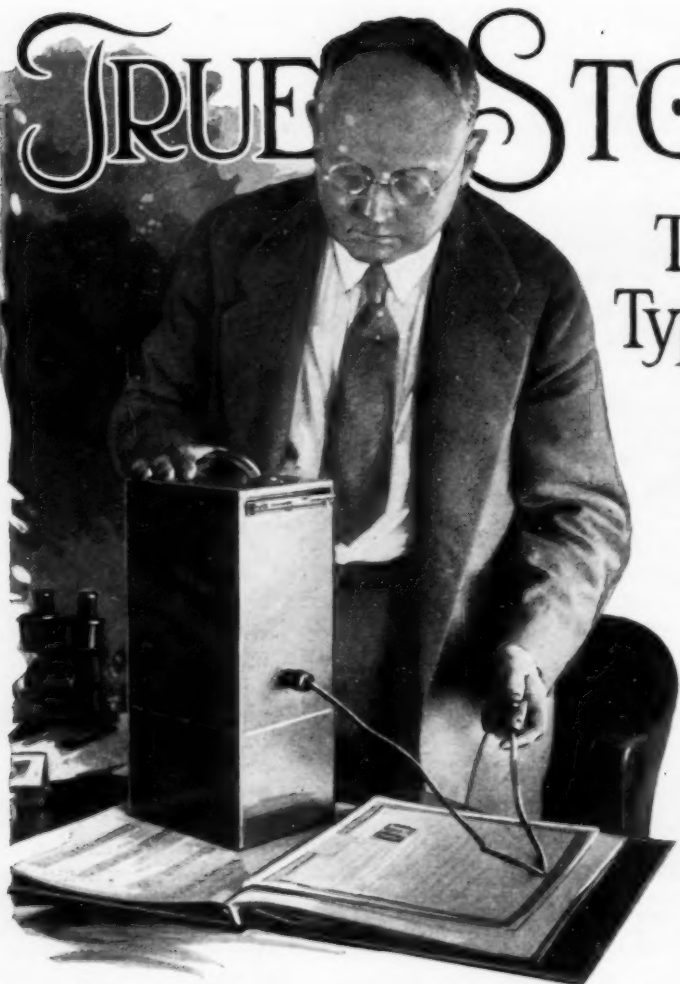
RESERVOIR IN WOODEN CANDLE SUPPLIES OIL TO WICK

Wooden candles have proved desirable substitutes for those of tallow in decorating, as they will not bend or sag under high temperatures, but their practical service has been limited in that they cannot be lighted. This drawback has been overcome in a wooden candle with a small reservoir to hold fuel, which is supplied through a wick. A metal tip prevents burning the wood and keeps the end bright.

Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

TRUE STORIES

Tell Tale Typewriters



Mr. Wood Using the Special Camera Apparatus to Photograph Portion of a Page When Volume Cannot Be Removed to His Laboratory

By PAUL PADDOCK

WHILE all typewriting may look alike to the ordinary eye, the microscope and camera of the scientific crime detector have revealed that no two typewriters, even the same make, are alike, and even the peculiarities of the writer are revealed by the cold type when put under the lens.

Not long ago, a letter, dated Dec. 15, 1908, was introduced at a trial in Illinois. It fixed a lawyer's fee at \$2,000 instead of the \$10,000 the court had decreed the defendants should pay, and, naturally, they were anxious to save \$8,000. But the attorneys for the plaintiff detected what appeared to be marks of erasure. Expert

examination proved that, although dated 1908, the document had been written on a machine that was not manufactured before 1916. This was established by the style of type. Then, there were five little defects in the typing which tallied perfectly with five defects in the typing done by a machine the defendant had rented a short time before the letter was introduced in court. Finally, the camera showed that a liquid ink eradicator had been used on the page to remove all original contents but the signature, which, with the firm's printed letterhead and the paper itself, was the only genuine thing in the whole document.

This was a famous exhibit in a case in which the supreme court of Illinois, for the first time in its history, ruled on the question of typewriter forgeries. It is only recently that the courts have fully recognized the significance of evidence of this kind. In older days, the question of the genuineness of a document was left largely to the opinion of someone who professed skill in such matters, but today, ferreting out the forger is one of the most highly developed and exacting phases of criminal investigation.

Step into the office of Jay Fordyce Wood, Chicago, examiner of questioned

of the MANHUNTERS

documents, and you will see how efficiently modern science is armed to combat the forger. True stories, many of them now matters of court records, far more absorbing than fiction, center about Mr. Wood's microscopes and cameras. Here you will see enlarged photographs of the crooked "m" and the odd "d" of the typewritten ransom letter which helped send two slayers to prison. In this office are interesting solutions of the oft-repeated question, "Is the will genuine?" for Mr. Wood's verdict on signatures and other handwriting has been sought in scores of lawsuits.

"Almost every case brings a new riddle and, consequently, new interest," said Mr. Wood. "and sometimes I feel that, if the people who think they can profit by forging only knew what a broad trail they leave from the instant they touch the paper, they might hesitate a long while before doing so.

"Take the typewriter, for instance. Many persons believe that it will guard their secret securely where the handwriting would expose them at once, but a typewriter is about the worst instrument, from the forger's standpoint, that could be used. Instead of covering up his path, it tricks him at practically every punch of the keys.

"The reasons are simple. For many years, it has been the custom of manufacturers to change the forms of type from time to time. We keep track of these

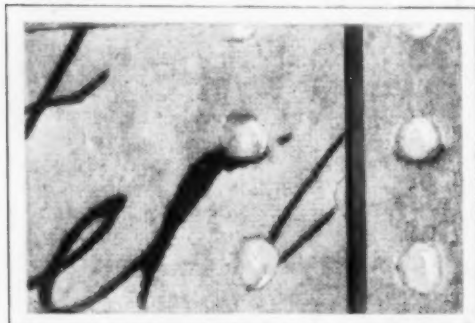


Fuming Operation in Progress: Fumes Pass from Heated Container through the Tube and Spread over the Page, to Restore Faded Ink So That It Can Be Photographed

changes and know the machine numbers and the approximate dates when the alterations were made; so we have a pretty certain clue that something is wrong if a 1908 letter is written on a 1916 machine.

"Eight makes of typewriters do practically ninety-eight per cent of all the typing in the world, so it is not very hard, usually, to discover which make of machine was employed on a certain piece of work by measuring and comparing the type, as there are telltale peculiarities in the letters of every typewriter. With a camera I can take a photograph of the type, enlarged 2,500 times so that anyone can recognize the clues the machine has left. Instead of protecting the forger, the

typewriter plays tricks that often betray. Now there is another interesting thing about typewriting that not many people realize. It is sometimes possible, from the typing, to identify not only the make and particular machine used but also to identify the operator. No two typists have exactly the same touch, they space



Ink Flowing around Edge of Perforation Showed That Writing Was Made After Paper Was Punched

differently, perhaps, or they make the same mistakes repeatedly. In other words, personality, to a degree, is transmitted through a typewriter just as it is through handwriting.

"Since a typewriter is a mechanical thing, any variation in its normal functions is likely to be very plain. Suppose you type part of a page, release the paper and then reinsert it. Unless you have adjusted the sheet with exacting instruments, it is likely that the rest of your typing will be more or less out of line. Here is a little glass gauge that helps to measure such variations down to the one-thousandth of an inch.

"In every typewriter with the ordinary, or pica, type, there are ten letters to the inch with the exception of one make, which has eleven. Elite type makes twelve letters to the inch. I had a puzzle not many months ago in a specimen of elite typing with eleven characters to the inch instead of twelve. The typing was in a letter which threatened the life of a physician. Finally, I discovered the make of the machine. The manufacturers were able to tell me just where the typewriter had been sent and it was not long before I was confronting the man who had written the letter.

"A common attempt at deception is to use ink eradicators, but they do not re-

move the ink, which is merely bleached so that it cannot be seen by the unaided eye. However skillfully the bleaching has been done, a slight yellowish stain may be left. By letting the light shine through from behind the page and taking a photograph, the stain, because of the action of certain photographic emulsions, appears black in the finished picture, and the tampering is clearly indicated."

Mr. Wood illustrated how scratches on paper stand out as small "hills and valleys" under magnification and proper light. This introduced the question of watermarks, the designs in the body of the paper, and how often they reveal a forgery. The mark is simply a thin place in the page where the fibers have been compressed during manufacture. A dated watermark, or one of special design, introduced at a definite time, is a common clue to paper in a falsified document.

An effective instrument the examiner uses to study questioned documents is the binocular microscope which reveals the surface in three dimensions and makes the slightest alteration or defect clearly visible to the eye. The usual microscope shows objects in only two dimensions. Another tool is the comparison microscope for study of two lines of writing or typing at



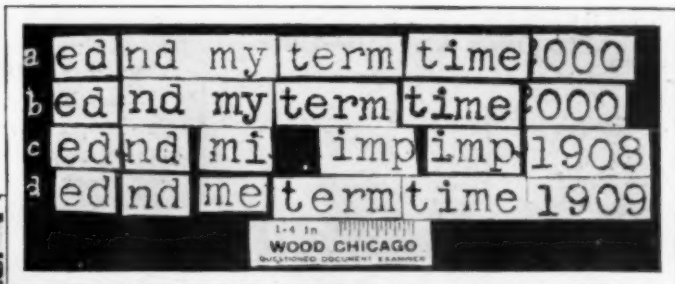
Mr. Wood at the Binocular Microscope That "Gets behind the Lines," Revealing a Surface in Three Dimensions Instead of the Usual Two

the same time. With special glass gauges, fine differences in the curves of handwritten or type letters can be distinguished and any malalignment of characters dis-

covered. With color filters, in photographing, difference in the colors of inks may be brought out. It also is easy to restore ink which has been erad-



Alterations on an Envelope Cancellation Plainly Revealed by an Enlarged Photograph and Samples of Typing in the Fee Case; Line A Is Reproduced from the Letter Itself; Lines B and C Are from Samples Typed on the Machine Rented by the Defendant, and Line D Is from a Genuine Letter; Note Similarity in the "M's" and "D's" of the First Three Lines as Compared with the Fourth



plied, "and frequently, while you may be sure that the signature or other detail in question is spurious, you cannot present sufficient evidence to justify your opinion and make it valuable as a bit of court testimony or evidence.

"If I find two signatures absolutely identical, I know that one or both of them are forgeries, for you never write your name or any other word exactly the same way every time. Perhaps you

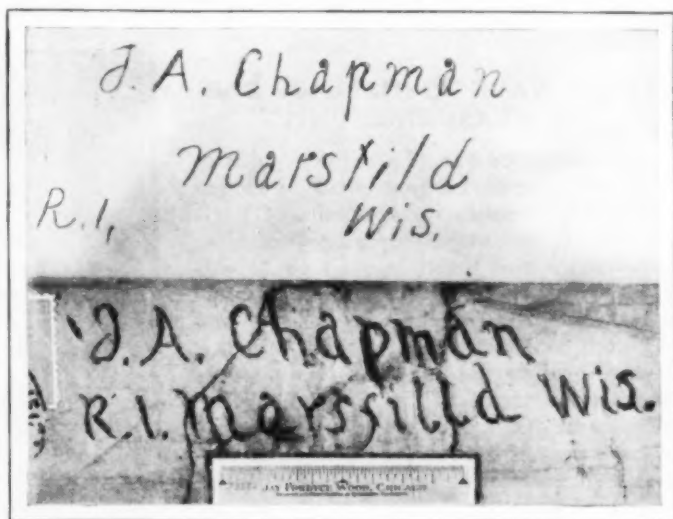
icated, or bleached, to color if the ink contains iron. This is accomplished by fuming. If there was iron in the ink, the fumes of certain chemicals, reacting upon it, cause the writing to reappear so that it can be photographed.

When court records, hotel registers and other documents must be photographed without being moved to a laboratory, he employs a small box camera which is simply placed on top of the page. It contains lights which are connected to a wall socket with an extension cord.

"With all these ways of discovering the forger, how can any fake document escape detection?" Mr. Wood was asked.

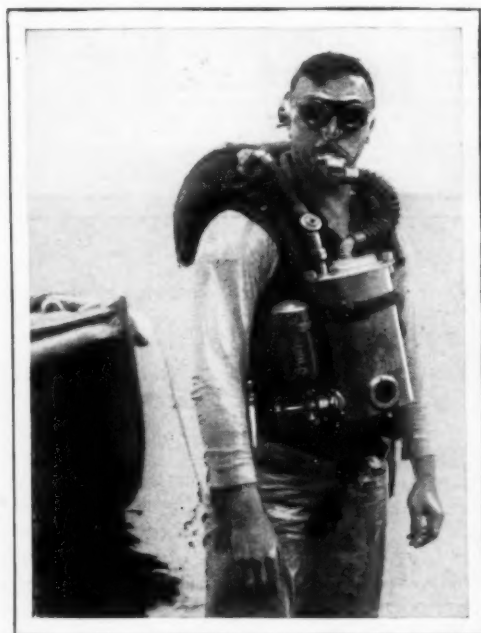
"There are some very skillful forgers," he re-

can disguise your handwriting to your own satisfaction but you cannot produce anything other than your own normal handwriting in a free, fluent manner."



Signatures That Helped Convict a Man of Murder; Lower One Was on Package Containing a Bomb; Compare It with Upper Sample of Writing

PORTABLE DIVING SUIT CARRIES ITS OWN AIR SUPPLY



For Diving in Shallow Water; Suit with Air Supply Permits Wearer to Stay Under Ten Minutes

For shallow-water diving where the pressure is not great, a portable outfit, devised in Germany, eliminates the need of air pumps. It is quickly adjusted or removed, is not heavy and is said to permit the wearer to remain submerged for at least ten minutes in safety and comfort.

LIGHT WAVE TO DISPLACE BAR AS MEASURING UNIT

The X-shaped bar of platinum and iridium which has been so carefully guarded for several decades in the vaults of Paris as the world's standard measuring rule, for science and technology, is to be displaced. At a recent meeting of international measuring experts in Paris it was decided to substitute for this standard meter—or International Prototype Meter—to give the metal rod its full name—the average length of more than a million and a half waves of light. Technically the new standard meter of the world will be the length of 1,533,164.13 waves of the red ray emitted by atoms of luminous cadmium. When the metric system was established

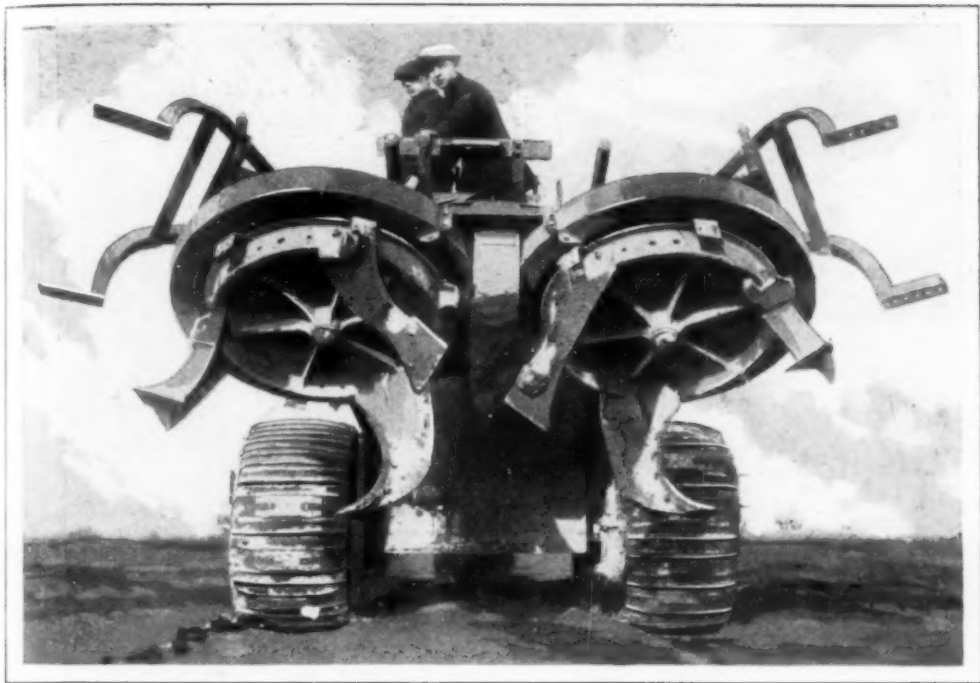
by France, it was proposed that the meter, as the unit of measurement, should be a definite portion of the circumference of the earth. Actually a mistake was made in the measurements, so the meter never was that small portion of a great circle, and since it was established, science has discovered that the earth not only isn't a round globe, but that it probably changes its shape from time to time, so that no permanent circumference can be assigned to it. The platinum and iridium bar, however, had been accepted by all the bureaus of standards throughout the world as the basic measurement to which all other things were compared. It has many drawbacks, for it was subject to expansion and contraction unless kept at an absolutely even temperature, and was also subject to changes through physical accident. The new standard meter can be reproduced at will and would always be the same.

FLOODLIGHT ON OLD LANDMARK RECALLS EARLY HISTORY

Spotlights are literally turned on one of the early American scenes with the nightly illumination of the house used by Washington for his headquarters at Valley Forge, Pa. The lighting emphasizes the beauty of the old building and attracts the attention of thousands of motorists, many of whom would miss seeing the landmark were it not for the lamps.



Where Washington Had His Headquarters at Valley Forge; House Illuminated by Floodlights



Huge Plow Constructed for Work in Large Fields Such as Those of a Sugar Plantation; the Cutters Rotate as the Tractor Proceeds, Thoroughly Stirring and Breaking Up the Soil

PLOW WITH REVOLVING SHARES THOROUGHLY STIRS SOIL

Designed especially for large plantations, a rotating tractor plow has been introduced in London. Instead of the usual form of shares, it has revolving cutters that operate in such a manner that the soil is stirred and is given two breakings in one trip of the outfit.

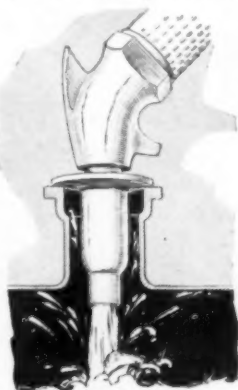
TALKING MAN MADE OF RUBBER HELPS DRAW CROWDS

Fashioned of rubber and papier-mache, a figure of a man that talks and reproduces realistic facial expressions while doing so, has been devised by Paul P. Moller, chief artist of the department of agriculture. Several weeks were required to construct it and it cost \$1,000. The principal difficulty was in imitating the movements of the face. By arranging two central cords, one on either side of the face, running from the temples in a straight line to the point of the chin, and moving them by the vibrations of an electric motor inside the man, the model was made to produce much

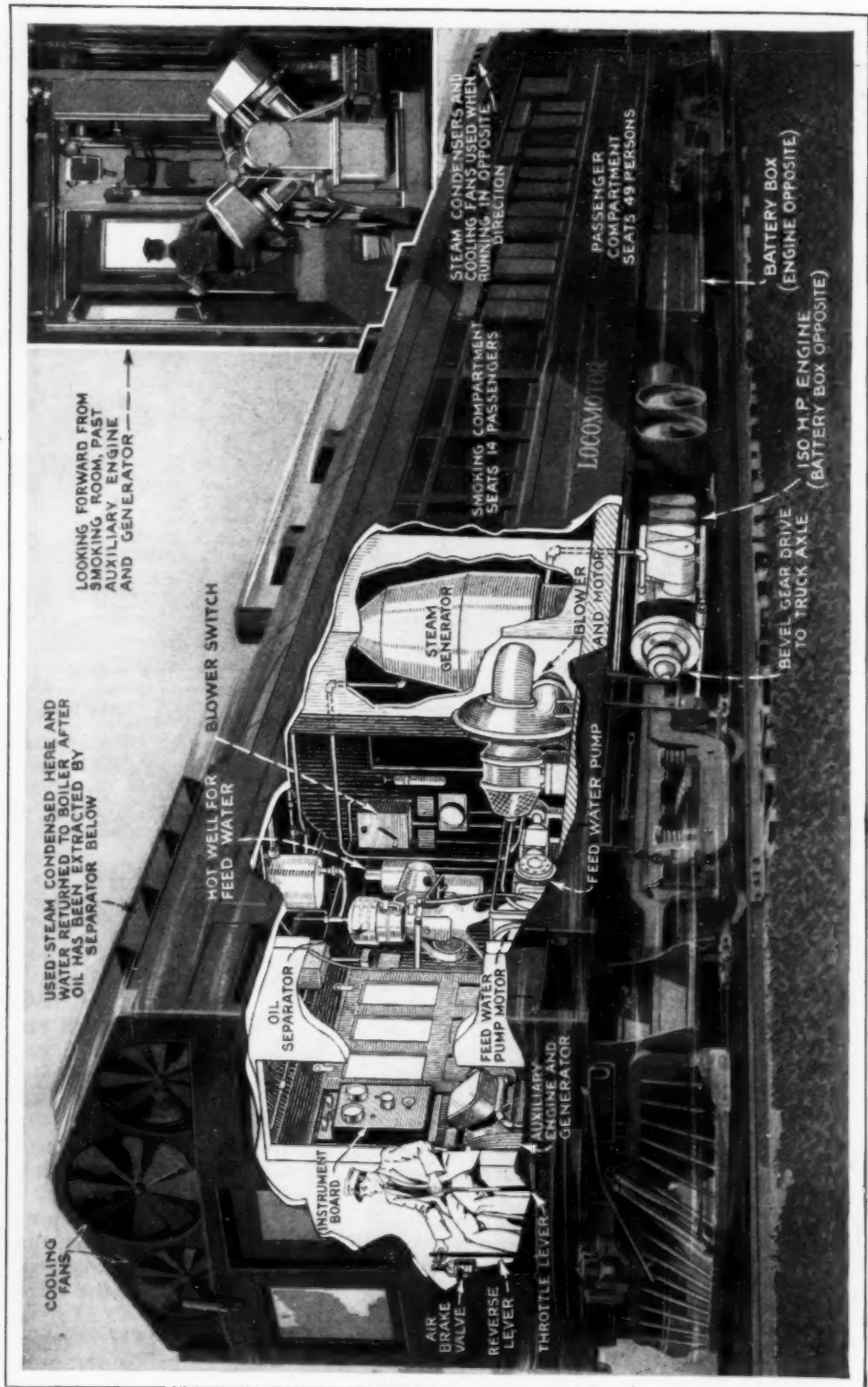
the same expression as that of a human person while talking. The jaw and other movements were synchronized with the speech, which was transmitted through a microphone mouthpiece.

GASOLINE NOZZLE HAS VALVE TO PREVENT DRIPPING

Fitted with a valve that shuts off the flow as soon as the hose is removed, a gas-



oline nozzle, now on the market, reduces the likelihood of fires or explosions and prevents waste. The valve is operated by a spring which presses against the top of the tank when the hose is inserted, allowing the valve to open. As soon as the nozzle is withdrawn, this spring automatically shuts the valve.



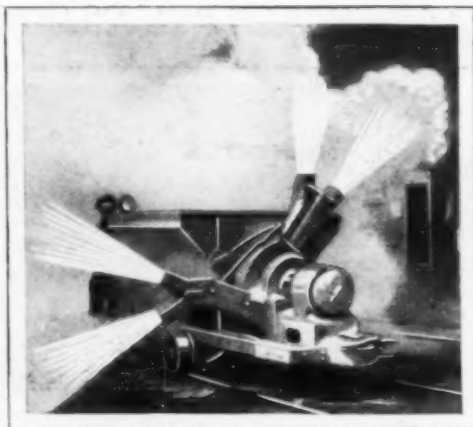
Steam Locomotive and Passenger Car Combined in One, with a Speed of Eighty Miles an Hour; the Power Plant Is Noiseless, Burns Low-Grade Fuel Oil, and, through Two 150-Horsepower Engines, Is Capable of Pulling Several Trailers

HIGH-SPEED STEAM RAIL CAR HAS HIDDEN BOILER

A self-propelled steam railroad car, literally an enlargement of the steam automobile idea, has been developed to compete with gasoline, Diesel and gasoline-electric cars in handling high-speed passenger traffic. The car, with its steam boiler hidden in the baggage compartment, seats forty-nine passengers in the main compartment and fourteen in the smoking room, and is capable of hauling itself and trailers at a speed of eighty miles an hour. The high-pressure boiler, heated by an oil burner, operates at 600 pounds' pressure, more than twice the usual pressure on the best superheated steam engines. The pressure and temperature are automatically controlled. When the pressure touches 600 pounds, the fire is automatically extinguished, and lighted again when pressure drops to 550 pounds. From the boiler, steam passes, through a storage reservoir, to the two eight-cylinder engines, and then back to condensers located in the roof of the car, and cooled by three blower fans. Condensed, the hot water returns again to the boiler. An ordinary steam engine of similar power, but without a condensing system, would use more than 500 times as much water. As the deposit of solids to form boiler scale is limited to the amount of water originally used, it is estimated that an ordinary steam engine would collect as much scale in one month as the self-propelled car would in forty to fifty years.

Although the power plant is located at one end of the car, controls are installed at both ends, so it can be operated in either direction as easily as a double-end street car, eliminating the necessity of turning around.

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



Dust-Spraying Outfit in Action; the Particles Help Cleanse the Air of Dangerous Gases

MINERAL-DUST SPRAYER CURBS DANGER OF EXPLOSIONS

Dangerous gases that are likely to explode in tunnels, mine shafts and other confined places, are being counteracted by spraying the interiors with mineral dust. The treatment does not entirely eliminate danger, but, if applied in time, it is said to be effective in about ninety per cent of the cases. The dust eliminates hazardous accumulations of the gas and is spread from a motor-driven blower.

UMBRELLA WITH KINKED STICK HELPS SHELTER TWO

With an ordinary umbrella, it is difficult to shelter more than one person, but an improvement has been introduced by an English inventor in one that has a folding stick. It can be bent over at an angle, if desired, throwing the canopy farther to the side, thus bringing it well over the shoulders of the person walking next to the one holding it. The adjustment is easily made, the "kink" locks securely, and the umbrella can be used with the rod straight, if desired.



To Make the Umbrella More Effective; the Kink in the Stick Shifts the Canopy Farther to One Side

FRANCE BUILDS GIANT "TANK OF THE AIR" FOR



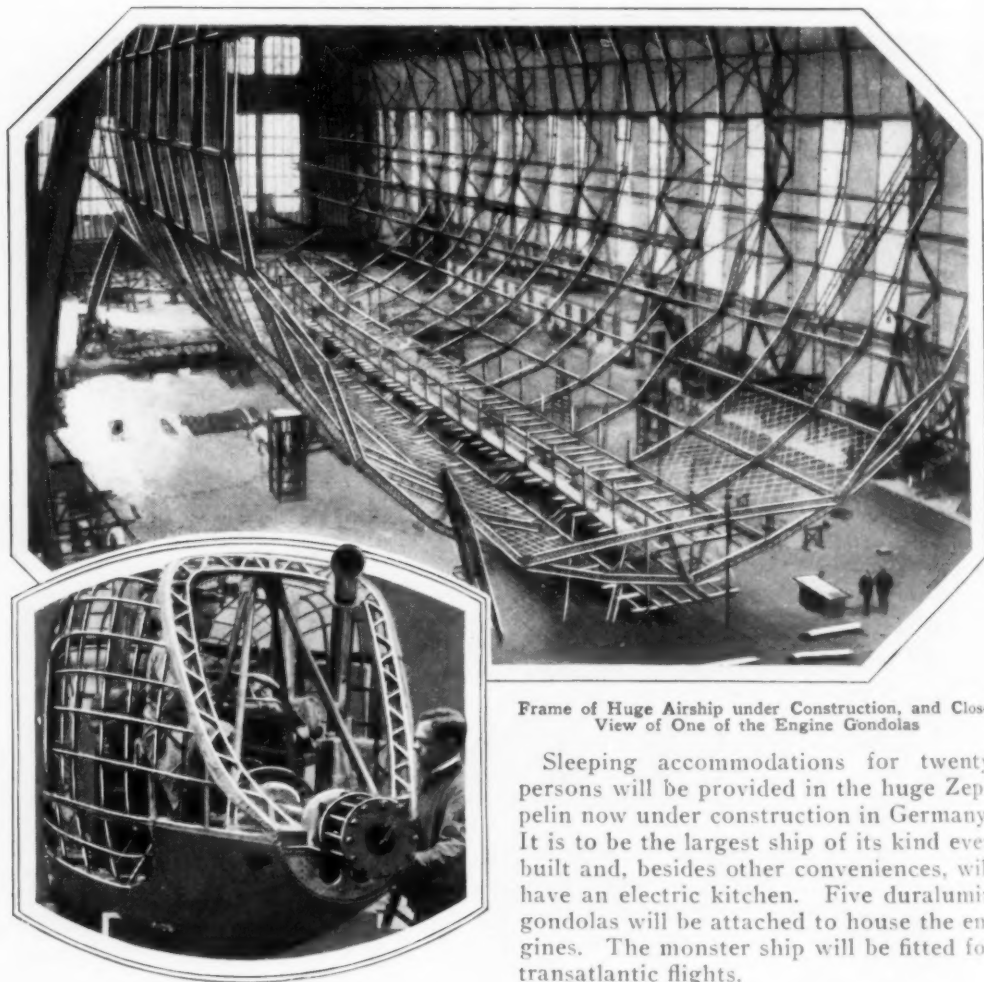
Measuring Eighty Feet from Wing Tip to Tip, This Giant Armored Plane, Literally a Flying Tank, Has Been Completed in France; the Ship Carries One and a Half Tons of Bombs

NIGHT BOMBING RAIDS OVER ENEMY TERRITORY



Instead of the Usual Fuselage, the Crew and Bombs Are Housed in What Is Really a Thickened Section of the Wing; the Craft Weighs Five and a Half Tons and Makes 100 Miles an Hour

SLEEPER IN HUGE ZEPPELIN TO HOLD TWENTY



Frame of Huge Airship under Construction, and Close View of One of the Engine Gondolas

Sleeping accommodations for twenty persons will be provided in the huge Zeppelin now under construction in Germany. It is to be the largest ship of its kind ever built and, besides other conveniences, will have an electric kitchen. Five duralumin gondolas will be attached to house the engines. The monster ship will be fitted for transatlantic flights.

PICTURE THREE BILLION STARS WITH BIG TELESCOPES

How man is constantly pushing back the borders of his mental horizon is well illustrated in the activities of the astronomers who now have instruments whereby they can photograph at least 3,000,000,000 stars. Dr. W. W. Campbell, president of the University of California, recently called attention to the fact that the sharpest eyes, unaided, can count not more than 7,000 stars in the entire sky, but with modern reflecting telescopes and long-exposure photographic plates, the images

of millions of stars can be recorded. Approximately 100,000,000 could be seen if trained observers had the time to sweep the entire sky with the largest telescopes. Astronomers picture our stellar system as a huge space, shaped like a double-convex lens. It is so far from one rim to the other that light, traveling at more than 186,000 miles a second, would require from 200,000 to 300,000 years to pass from one edge to the other. The thickness of the system is thought to be about one-fifteenth of this distance. Our stellar group is believed to be a spiral nebula and, beyond it, are thousands of other nebulae,

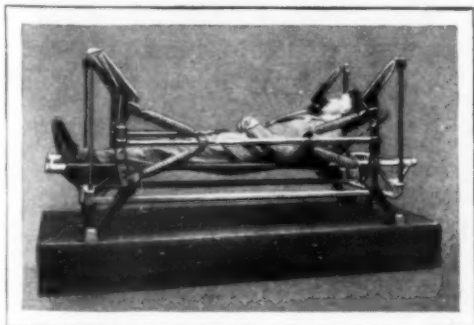
each containing millions of stars. Some of the objects already recorded on photographic plates are so far away that the light now reaching us from them, probably left its source as long as 100,000,000 years ago.

A NEW MALADY

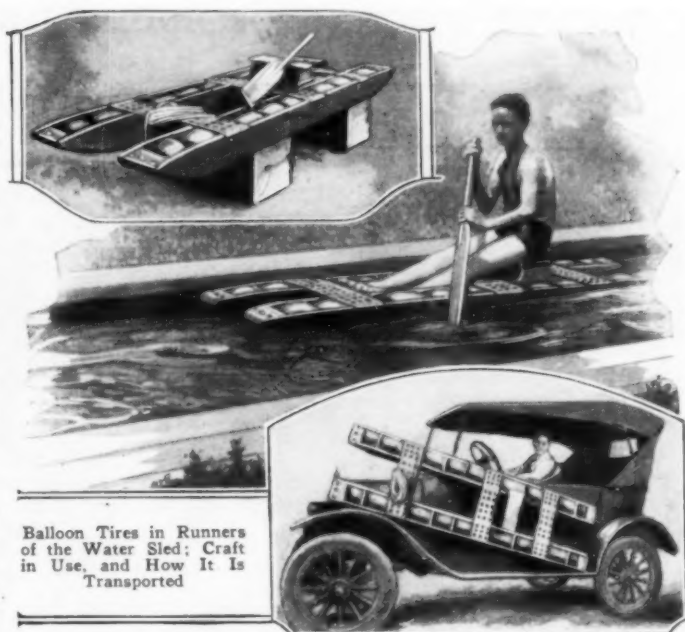
Repeated thrusting of the foot forward to engage the clutch or brakes of the auto, is causing a malady among men known as "chauffeur's foot," according to specialists. It is not found among women, as their high heels have accustomed the muscles and tendons to the forward movements. Inflammation of the heel bone, which causes men to walk somewhat gingerly, is one of the results of the trouble. It would disappear, the doctors say, if chauffeurs wore shoes with higher heels.

SPRING STRETCHER FOR INVALID PREVENTS SHOCKS AND JARS

Transporting sick or injured persons in automobiles or other vehicles can be done with little risk and greater comfort for them in a special stretcher equipped with stabilizing springs. They are adjusted to make the journey as nearly vibrationless as possible, shock absorbers being placed where necessary.



To Shield the Injured Person from Jars during Journey; the Spring Stretcher under Demonstration



Balloon Tires in Runners of the Water Sled; Craft in Use, and How It Is Transported

WATER SLED OF BALLOON TUBES INSURES BOATING SAFETY

Pontoon-shaped boats, slightly more than seven feet long and two feet wide, have been devised by a Florida man for service and amusement. Balloon tubes in each "runner" insure buoyancy, and, even though the craft should upset, it would not sink. The boats are made for propelling with oars or outboard motors.

TRIPODS FOR TELEGRAPH POLES RESIST FROST ACTION

One of the difficulties in building the Hudson Bay railway is that the "heaving" action of the alternately freezing and thawing ground, forces the telegraph poles out of the ground. Putting the posts in concrete foundations does little good, for the frost lifts foundation and all. The problem was solved by erecting tripod supports for the posts. These were placed but a few inches in the ground so that the frost could not obtain a sufficient hold to disturb the legs of the tripod. Bracing with wire struts made a firm base, and the plan has proved so successful that it is proposed to substitute the tripods for ordinary poles along the entire line.

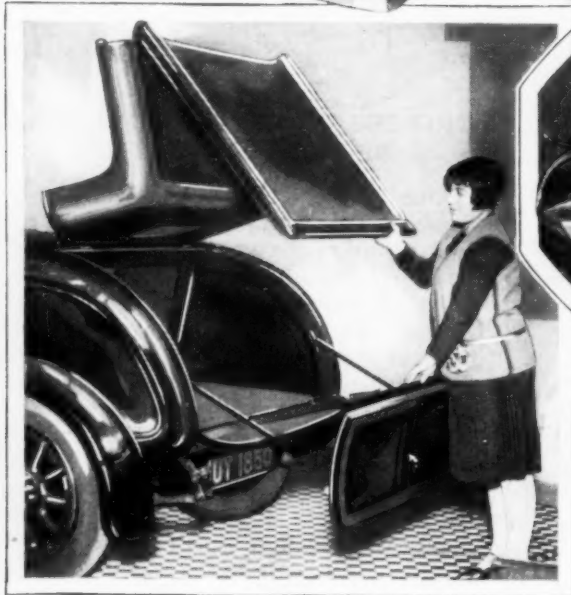
NEW INVENTIONS FROM ENGLAND'S PATENT SHOW



A Midget Washing Machine, with a Glass Front to Display the Work. Above, Was One of the New Things Shown at the Recent Annual Exhibition of Patented Devices in London; at the Right Is Another of the Year's New Things, an Electric Iron with a Heat-Control Switch, Conveniently Placed under User's Thumb



Londoners Have Found a New Use for the Small French-Type Auto Horn; Attached to the Umbrella Handle or Walking Stick, It Furnishes a Convenient Warning Blast for the Pedestrian Who Wants to Stop Traffic While He Crosses



Something Entirely New in Closed Cars with Disappearing Tops Is Being Produced in England; as Shown at the Left, the Collapsible Top Disappears into the Rear Luggage Compartment, an Arrangement That Makes Sturdy and Rigid Construction Possible, Instead of the Usual Folding Canvas Affair; Above Is a New Type of Roller Skate Which Runs on a Single Wheel, Yet Is Claimed to Be Faster and Safer Than the Conventional Kind

BEES MADE BUSIER BY LIGHTS

By directing a beam of light upon the entrance of their hives, an English bee-keeper has stimulated his bees to earlier activity, so that they produce an average of seventeen pounds more honey per colony during the season. He started the experiment in the spring. Light from electric lamps was focused on the hive openings and supplies of food were placed near by, so that the bees could go to work as soon as they flew out.

COLD STEAM KILLS INSECTS ON CROPS

Instead of the usual pressure-spray system of treating plants to kill insects, a cold-steam process has been developed which is said to require smaller quantities of liquid, saves time and reaches all parts of the plant more thoroughly. The poisonous substance is broken up into a fine mist by the introduction of steam from a portable boiler, which burns gasoline, and is distributed at a pressure of eighty to 100 pounds. Water is employed to disintegrate the poison, and the coarseness of the spray can be regulated by means of a valve which governs the amount of steam entering the nozzles. The entire spraying outfit may be mounted on a cart, and as many as eight nozzles can be used at once. The inventor believes the apparatus will effect a saving of thirty to forty per cent in chemicals.



Courtesy The Graphic

Weird Mask Used by Tribe in New Britain during Ceremonies When Boys Are Admitted to Full Membership

LONG-NOSED MASK FEATURES TRIBE'S INITIATIONS

When boys are admitted to full membership in the Baining tribe, inhabitants of New Britain, a ceremonial mask, like

the one illustrated here, is worn during the rites. It is considered a rare specimen because of the extremely long nose, only one other of the kind being known to scholars, it is said. This mask was shown at a recent ethnological exhibition in Berlin.



Spraying Field with the "Cold-Steam" Outfit Which Covers Wide Acreage and Does Thorough Work



Part of the Magnet Apparatus Which Was Used to Stimulate the Growth of Small Animals and Plants

MAGNET AIDS GERM GROWTH AND STIMULATES PLANTS

Interesting effects of magnetism on one-celled animals and on plants have been observed in recent laboratory tests, suggesting the possibility that the treatment may eventually be adapted for the benefit of human life. By periodic applications of magnetism to lowly, single-celled water organisms, Prof. R. A. Muttkowski, of the University of Detroit, found that the vitality of the specimens was greatly increased. This was evidenced by longer life and by greater resistance to poisons. The stimulation apparently caused no harmful after-effects. Radishes and bean sprouts, subjected to the treatment, grew faster and were more quickly revived after withering. The magnetism used was of the same character as that which deflects a compass or picks up nails, but the apparatus employed produced certain oscillations which are thought to have caused the striking effects noted. Physicians have

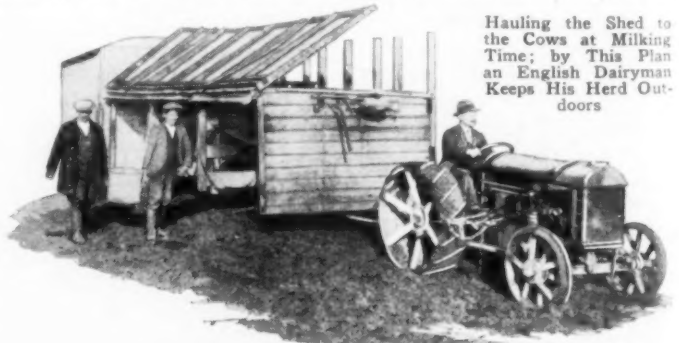
used the treatment on glands with remarkable results, it is reported. An explanation of the phenomenon is that, in living matter, the motion of the atoms and molecules sometimes lags. The magnetic radiations are thought to re-energize the atoms, restoring their normal momentum.

DARKNESS CREATED BY LIGHT IN NEW STAGE EFFECT

Using colored lights in place of a curtain to shut off the stage while scenery is being changed has been introduced in London. The system allows the auditorium lights to remain on, but forms an impenetrable curtain of black before the stage, so the audience cannot see the scene shifters. The inventor made the discovery while experimenting with the effect of colored spotlights on women's gowns. He found that by projecting a certain hue on a blue gown the dress appeared to be black. Substituting a blue ray for the gown, he projected amber and pink rays on the blue light and produced a black screen. In stage use, projectors throw a curtain of blue light across the space usually occupied by the stage curtain, and on that the other rays are projected, to black out the stage.

MILK SHEDS TOWED TO COWS TO KEEP HERDS IN OPEN

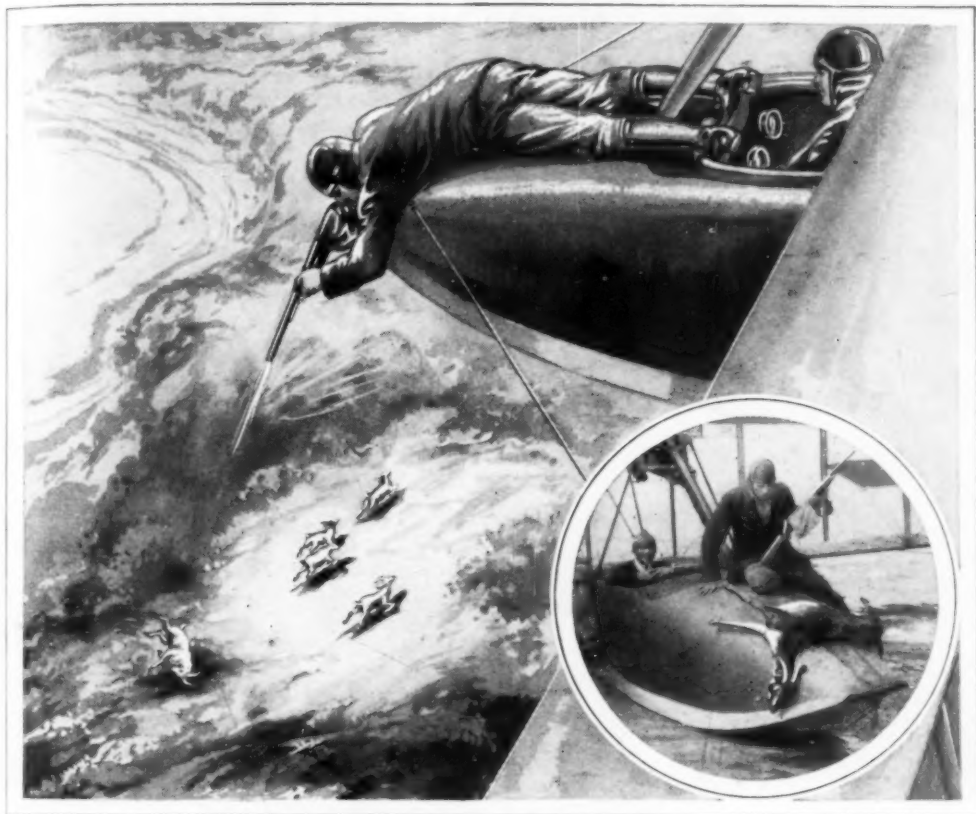
Believing that his cows will have better health if not confined in barns, an English dairyman keeps them in the open all



Hauling the Shed to the Cows at Milking Time; by This Plan an English Dairyman Keeps His Herd Outdoors

the time. When the milking hours arrive, sheds are towed to the herd with a tractor instead of bringing the cows in.

HUNTING WILD GOATS FROM DECK OF FLYING BOAT



Shooting Wild Goats from an Airplane on Santa Catalina Island; There Is No Bag Limit, but Hunters Must Pay \$2 Each for Every Animal Shot beyond the Free Allowance of One to a Man

After being closed to hunters for nearly twenty years, Santa Catalina island, off the coast of southern California, is now open to sportsmen who desire to hunt wild goats there. It is estimated that the number of these animals on the island is between 20,000 and 30,000. Moreover, under the plan of hunting announced a few days ago, a rich man's sport is placed within reach of the poor man's purse. Each hunter is entitled to one goat. If he wants more, they're \$2 each on a hunting license that's punched like a meal ticket, and there is no bag limit. The wild goats on Santa Catalina island are descendants of domestic Spanish goats liberated there during the sixteenth century by the Cabrillo and Vizcaino expeditions. They were put there to propagate a source of food supply for mariners in distress. Four hundred years of wild life among the lofty

crags and precipitous canyons of the island has transformed them into an animal that is as difficult to hunt as the bighorn mountain sheep, the chamois, or the ibex. The flesh of these animals, particularly of the younger ones, is comparable to the finest domestic mutton.

FUEL GAS FOR AIRSHIP MOTORS TO MAKE FLYING SAFER

Tests with a fuel gas, having nearly the same weight as air, are being conducted in Germany for use in airships. It would do away with liquid fuels, which are a source of danger and a disadvantage in aviation because of the lightening of the ship as they are consumed. Since the gas has about the weight of air, the balance of a dirigible, for instance, would be disturbed very slightly, if at all.



By HAROLD T. WILKINS

IN a machine-made age of television and transatlantic planes, the lure of hidden treasure still holds a thrill for everyone. From the far-off day when King Herod, of old Judea, went by night to Jerusalem to explore the tomb of David and Solomon for treasure of gold talents and jewels, and was scared into headlong flight by a blast of flame rushing at him from recesses of the stone vaults, down to our own age, when scientists, collecting for American museums, call in passing at pirate lagoons, human nature has not changed in this respect.

In ports all over the eastern seas, from Singapore and Manila, to Yokohama and Frisco, you will find, today, seafarers who are sure they know of caches of immense treasure ashore on lonely beaches and desolate islands, or sunken bullion wrecks in the waters of the south Pacific, or off China. They have seen old charts with

the imprint of Billy Bones, master of the "Walrus" of Savannah, who sailed the seas under Cap'n Flint, or crude sea-stained maps bearing the "anchor-his-mark" of Israel Hands, who begged his bread in the streets of old Wapping. Sometimes these yarns have a foundation of fact, and the treasure seekers are not always unscrupulous adventurers.

Some of the world's most fascinating stories of land caches of treasure originate in Lower California, Bolivia and Mexico. Back in the Cocopah mountains, in the district of San Diego, Calif., lies an immense treasure waiting to be unearthed by the picks and shovels or radio locators of a modern treasure hunter.

As far back as 1874, an American syndicate, called the Treasure Trove company, started to hunt up this cache. They did not find the gold, but the story is a remarkable one. One day, in 1873, a

HIDDEN TREASURES



Spaniard, named Pedro Pedrillo, tramped into San Diego footsore and broken, but excited. He said he had been two weeks prospecting in the Japa country, on the slopes of the Cocopah range, 300 miles east of San Diego, across the Gila desert. One afternoon in the mountains he came on a crude cross, rudely carved with an inscription in Spanish telling the explorer to dig below.

Pedrillo removed the top soil and found a tin case. Inside was a scroll in faded ink, derived from some kind of berry. Said the long-dead writer:

'To whomsoever may chance to find this writing: I, Captain Jesus Arroa, commander of the brig 'Isabella Catolica,' of 800 tons, and fifteen guns, with a crew of twenty-five men, say that I was wrecked in a great storm off the coast of California, on 29th March, 1682. After we had struck on a reef, we made our way ashore in the ship's cutter. We carried nothing with

us save five cutlasses and an old arquebus, which was all we had saved from our buccaneering. Designing to keep ourselves alive by killing game, we struck inland in a northeasterly direction toward a range of high mountains. Here we met game in plenty, and bears abounded. Our single piece was of much service to us. Eight months we passed on the slopes of the mountains, and in the space of that time, we saw no human beings besides ourselves. Some of our company who had mined gold in the lands about the South seas (that is, Peru) one day saw gleams of sand-gold in the mountains. Much unseasonable rain and wind stormed down the ravines this season, and we at once began to gather and wash the gold from the rocks and the sands, and to store our treasure in hopes of future deliverance, when we desired to carry it to the coast, where peradventure a ship might chance to touch. We stored and hid great quan-

tities of gold dust. Misfortunes then came upon us. A band of painted savages of great stature, with enormous bows in their hands, bore down on our camp in the mountains. All our gold-washing was stopped. They shot a cloud of arrows, killing one of our company and wounding two. We retreated from our camp, but the big warriors followed us for two days, fighting and being resisted by us. I write this, fearing that death may come to all of us tomorrow. Commanding my soul to the Mother of God and all the saints, I will tell where we have hidden our great treasure. I pray that this writing may fall into the hands of a good Christian, whom I solemnly charge to buy, with a portion of the treasure, a golden candlestick for the altar of San Diego, in Seville, to say masses for my soul."

Then followed minute directions how

to locate the cache of buried gold. Pedro Pedrillo, the finder of the document, went to Vallejo to fit out an expedition of twenty men, to invade the Cocopah country. It may be that a landslide obliterated traces of the gold cache, but, anyhow, no report of the success of the expedition has since appeared.

How often is the ghost of luckless Captain Kidd—hanged in chains, in the heyday of piracy when William was on the British throne—dragged out to explain some treasure cache of would-be treasure finders! In May, 1924, for example, some men of Lewiston, Me., were planning a search of the Sheepscott river with the aid of a grappling device invented by a member of the party. The leader of the treasure hunters said that when he was a boy he saw the anchor of a sloop come aboard in the river, with a sea chest



Splendidly Equipped Yachts, Such as That Pictured Below, Are Employed in Search of Treasure Sunk with Vessels of Other Days, but Often to No Avail, for the Sea Guards Well Its Gold



Diver Descending to Work on Sunken Wreck While a Telephone Message Is Being Received from His Comrade Already Below; Inset Shows Bucket of Gold, with Debris on Top, Being Raised from the Sea



Insert Courtesy Sir Frederick Young, K. B. E.

hanging on its flukes. Before the crew of the sloop could grapple the chest, it fell off the anchor and went to the bottom. The party could think of no other possible owner of the chest than the long-dead pirate captain.

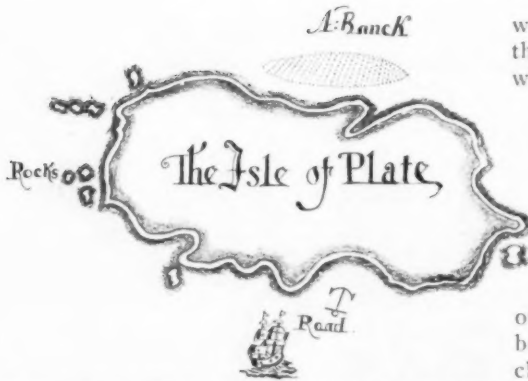
Many thousands of dollars of American money have been wasted looking for the buried doubloons and moidores of Captain Kidd, hidden on desolate sea beaches. Did Captain Kidd bury any pieces of eight and gold dust on a lonely island off the American coast, to wait the shovels of modern treasure hunters? Captain Kidd's own story was that he left 20,000 dollars in gold dust and fifty pounds weight of gold from Madagascar, the pirate island, in the custody of a Mr. Gardner of New York. Kidd sent the gaoler of Boston to Lord Bellomont, the governor of old New York and Massachusetts bay, to say that if the governor would let him out of prison he would go to his ship, the "Quedah Merchant," which lay off Hispaniola in the West Indies, and bring off 250,000 or 300,000 dollars, which would otherwise be lost. Bellomont refused to let him out of prison on any pretext. Kidd also said that he had buried gold at Gardiner's island, and at the east end of Nassau island, off the county of Nassau, New York state.

The treasure left in the hand of Gardner

of New York was seized by Governor Bellomont, and when the chest buried in Gardiner's island was dug up, in 1689, it contained no gold, silver or jewels, but silk and fabrics. The great ship left off Hispaniola, and containing piece goods only, was seen in smoke and flames, according to the report of a passing trading vessel. The yarn of Captain Kidd's buried treasure is a pure legend, and would-be treasure hunters will be well advised to forget it.

Every now and again, newspapers tell us that some one is on the trail of the famous "mountain of gold," in far northern Alaska. A number of the richest gold-bearing streams which made the fame of Klondike and Dawson City, are said to have their headquarters in a round mountain, and a few contend that in the heart of this mountain lies the world's greatest treasure. In 1911, prospectors sank a tunnel into this mountain, hoping to find either a huge deposit of gold, or veins streaking through the rocks. They had to give up, owing to the failure of the funds for more engineering equipment.

The American seaboard is ringed round with rich treasure wrecks waiting exploi-



Treasure Island Off Coast of Peru. Named from Golden Plate Sir Francis Drake Is Said to Have Buried There

tation by the modern salvor. There is the British frigate "Hussar," wrecked in the waters of Hell Gate sound, and containing \$4,000,000 in gold, the pay of the British troops engaged in the American Revolutionary war. The steamship "Lexington," sunk off Bridgeport, Conn., has many thousands of dollars and much bullion in her safe and strong rooms. In Delaware bay, lies the "de Braak," with \$5,000,000 in gold and silver coins; off Nantucket lighthouse is the \$2,000,000 bullion wreck of the "Republic"; while in San Francisco bay, is the hulk of the "Rio Janeiro," with a freight of gold, silver, ivory and jade worth \$9,000,000.

A sporting syndicate of New York lawyers and a Wall street broker spent a lot of money, in 1925, trying to raise the treasure of the sunken Ward liner "Merida," rammied in a dense fog and sent to the bottom of nine fathoms of water, off Cape Charles, Virginia, in 1905. It is known that the "Merida," bound from Yucatan to New York, carried a consignment of \$200,000 in silver, and had in her bullion room \$4,000,000 in gold, silver and jewelry, as well as the famous crown jewels of Austria, and the family jewels of ex-President Madero.

Three or four attempts were made to raise the treasure between 1915 and 1925. All failed, because the channel in which the wreck lies silted up, is a battleground of treacherous winds and waves. The 1925 syndicate had the aid of two famous American champion divers, Frank Crilley and J. F. O'Hagan. They found and buoyed the wreck, went down into her twisted cabinways and collapsed bulkheads, and

were blasting their way steadily toward the strong room and the submerged safes, when a storm arose, and made naught the strenuous work of many months and the best brains and latest diving apparatus to be found in America.

Along the highway of the treasure seeker of today, a finger post points ever to Mexico. Many are the gold and jewel hunters, bound to this land of promise, who have ruined their eyesight poring over crabbed charts, and puzzled their brains about stories of long-lost caches of church plate and gold and gems, recorded in rare manuscripts in Britain's and America's libraries and state archives.

A strange tale is told in Tucson City, Ariz., of an Englishman, who, some few years ago, headed a band of miners over the Mexican desert to seek the long-lost treasure of the "Mission Gold." The story runs that when Mexico was first colonized by the Spaniards, a body of monks went to the western part of what is now the state of Sonora. There they founded a mission, in a country inhabited by a fierce tribe of Yaqui Indians. As time passed, an enormous amount of gold drifted out of the possession of the natives into that of the monks. It is said that two tons of gold, worth today, at current prices, around \$1,525,000, were hoarded up by the fathers of the mission. When Maximilian adventured upon his short-lived career as emperor of Mexico, he decreed that all church gold and plate should be confiscated, except such as was in the form of chalices or other ecclesiastical ornaments. So the fathers made haste to convert their gold into cups and crosses. Shortly after, the Yaqui Indians rose in rebellion and drove the priests from their country. Before they went, the treasure was hidden carefully.

On a day in the fall of a recent year, an Englishman met a man in a Tucson saloon who was at death's door and destitute of money or friends. The Englishman befriended him, took the man to his own hotel, and sent for a doctor. For weeks the man was in delirium, and the doctor's heroic efforts barely saved his life. He recovered and told a queer story of a hunt for the gold hidden by the mission priests. Frank Montoya was the sick man's name and, when he was well, he undertook to

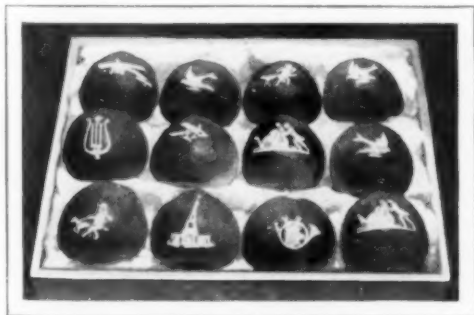
lead seven miners into the Yaqui country. They set out in the following spring, and trailed across miles of burning desert into Mexico. On the 160th day after setting out the miners climbed a high bluff, near which once stood the buildings of Yaqui mission.

As soon as darkness fell, the miners located a huge amount of gold, of which they loaded 200 pounds on each of six burros. On the way back, Indians attacked them. Montoya was shot and killed, and the attackers surrounded every water hole, where the prospectors had cached food and drinking supplies. One of the white men went mad with thirst and had to be shot in order to prevent him from killing the others in his frenzy. Pitched battles with the Indians were fought in which many were shot. The burros, carrying the gold, were either shot down or captured, and all that reached Tucson was three pounds of gold. One man died on arrival, and out of the sixteen men, all told, who at various times have tried to secure the mission gold, fifteen are said to have met untimely ends.

(To Be Continued)

SUN PICTURES ON RIPE APPLES FORM FANCY DISPLAY

By placing wax designs on apples while they are still green and allowing the sun to change the color of the fruit around them, an Austrian grower obtains novel patterns on his apples. The portion covered by the wax remains green, while the



Apples with Designs Made by Applying Stencil Pieces to Surface and Allowing Sun to Color the Rest

rest, tinted by the sun, causes the shielded area to stand out distinctly when the wax coverings are removed.



Handbag Closed, and with Compartment Open to Expose the Camera, Which Is Used in the Usual Way

CAMERA IN SIDE OF HANDBAG SAVES EXTRA CARRYING

For the convenience of the woman tourist, a handbag camera has been introduced. The instrument is concealed in one side of the carrier, which has spaces for the usual articles, but is quickly made ready for photographing simply by raising a flap. The arrangement saves handling two separate articles and the case effectively protects the camera from damage.

FACES REPRODUCED BY RADIO GIVE DIFFERENT SOUNDS

Different faces produce different sounds when sent over the radio by a special process now being developed, but they all have much the same tone as that of the whistle on a peanut stand, according to an eastern engineer. A face with a long nose is said to have a prolonged howl in the middle of its sound reproduction and sunken eyes will yield a noise like that of a muted whistle. A flat face with no deep wrinkles, gives an even note while an irregular one with deep character lines would sound like a tune on a penny whistle, the inventor declares. The tones are produced by converting the light waves into sound waves and then turning them back into light waves so that the picture may be reproduced at the receiving end.



Where Drinks Are Served from Coin-in-Slot Dispensers; Demonstrating the New Equipment in New York Store

COIN-IN-SLOT SODA DISPENSER SERVES QUICK DRINKS

Rapid service, greater cleanliness and reduction in cost are some of the features claimed for an automatic drink dispenser introduced in New York city. The customer slips a nickel in a slot and the desired drink pours forth into a fiber cup.

PHOTOGRAPH SPEED OF BLOOD

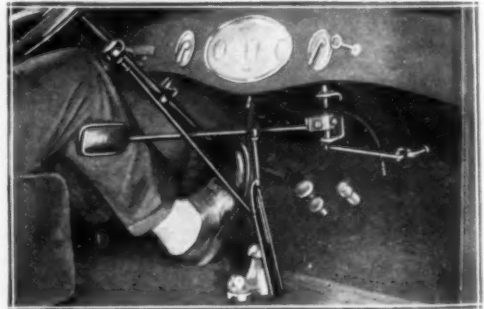
Photographs of the human blood stream in circulation are now obtainable with an improved apparatus developed for medical and chemical uses. Radioactive preparations are injected in small quantities into the blood of the patient. These can be detected with the apparatus when they reach different parts of the circulatory system. A record is made on a film as the

material passes a point where a detector is placed, and by suitable amplification impulses, set up by the rays in the substance which was injected, can be built up to such an extent that relays may be operated and a loud speaker made to register the sound. Readings may be made without an incision and by placing one or several chambers on various parts of the patient's body, the time of the arrival of the special substance can be checked at different points.

ACCELERATOR RUN BY KNEE AIDS SAFETY

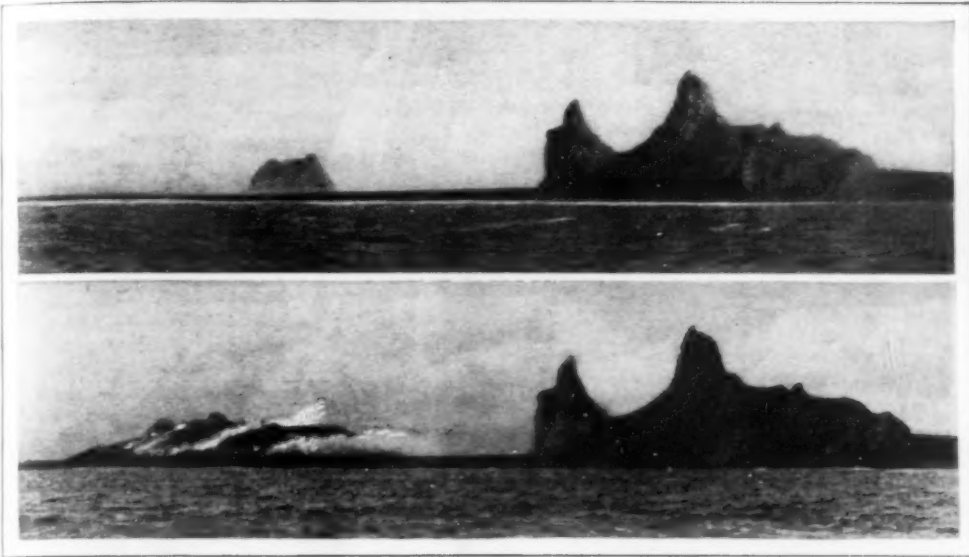
Added comfort, less danger and economy of fuel are claimed for an automobile accelerator operated by the knee instead of the foot or toe. It is especially convenient on long journeys and has become popular among women. Instead of being attached in the

bottom of the car, this accelerator is actuated by a leather-padded rod that rests against the knee and leg. It can be connected in a few moments, prevents confusion with the brake pedals and does not interfere in any way with the regular operation of the car.



Auto-Accelerator Installation Managed by the Knee; It Adds to Comfort on Long Trips

QUEER ISLAND SEEN AS CONTINENT IN THE MAKING



Bogoslof Island, as It Appeared in 1923, Shown by the Upper Photograph, and, in 1927, in Illustration Below; between the Rocks at the Right and Left of Picture Is Tip of Peak "Born" Last Year

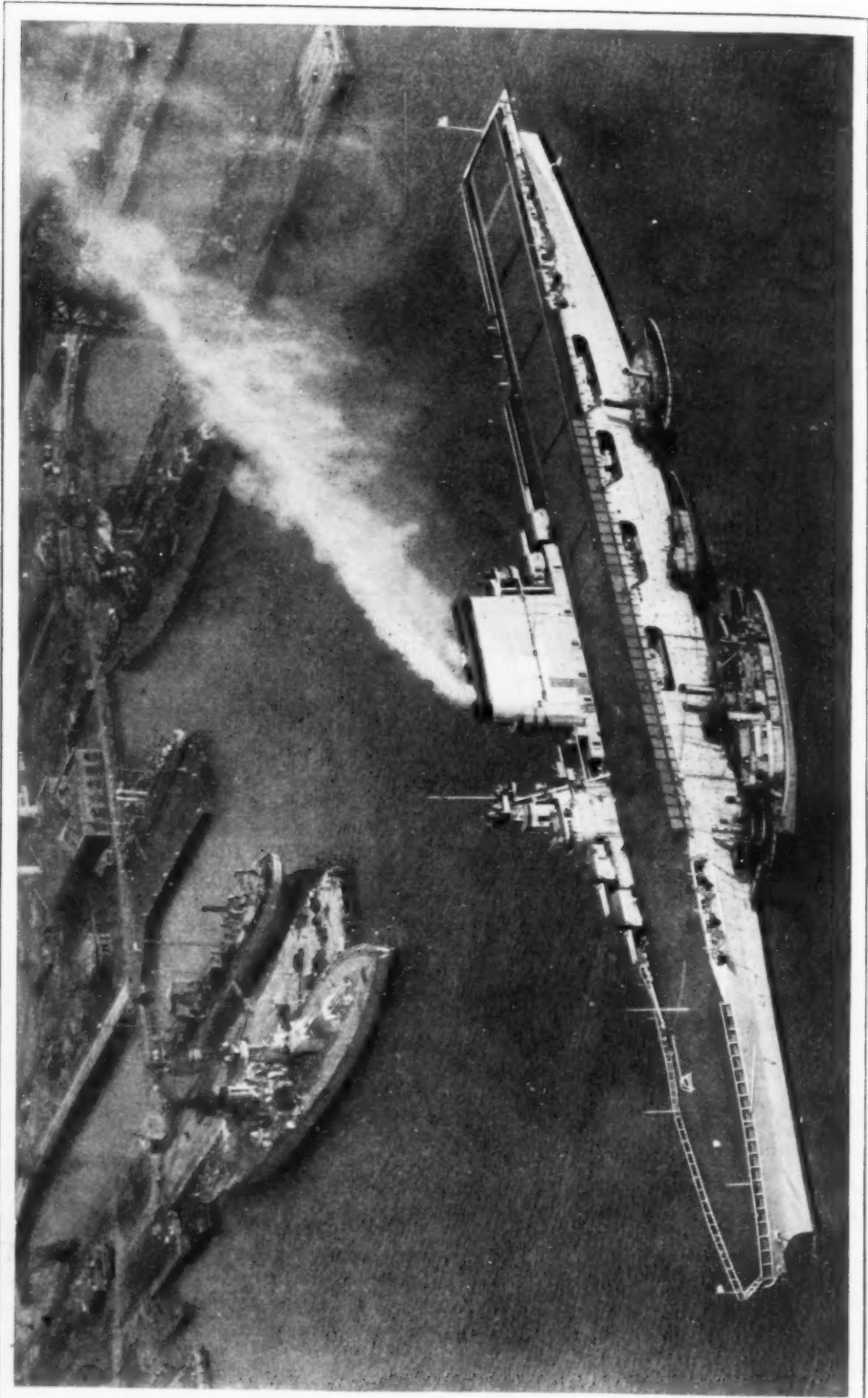
Is a new continent being born in the icy waters of Bering sea? This question is again puzzling scientists who are watching with renewed interest the amazing volcanic activities of Bogoslof island—"the island that won't stay put"—a remote uninhabited spot in Bering sea, forty miles from Unalaska, where another volcano has mysteriously thrust upward from the ocean bed. This constitutes the ninth definitely recorded volcanic disturbance since Bogoslof itself came into being 131 years ago amid the terrifying accompaniment of earthquake, fire and steam. The birth of the island, in 1796, was witnessed by a Russian named Kriukof, resident agent of the Russian-American company at Unalaska, who then chanced to be on the nearest part of the adjacent island of Umnak, thirty miles distant. The island continued to grow, and in 1817 its circumference was estimated at two and one-half miles, its height at 350 feet. Since those early days Bogoslof has been the scene of constant amazing disturbances equaled nowhere else in the world. Numerous expeditions have investigated the island and inspected and named the new peaks which arose from time to time, but often the peaks would have mysteriously disappeared before the newly drawn maps

were fairly dry. The latest visit to the strange island was made by the United States coast-guard cutter "Northland." Pictures were taken of the new peak, which showed clouds of steam girdling its crest and issuing from crevices. Bogoslof interests scientists because the new cones are the summit points of a volcano beneath the waves which is 2,000 feet higher than either Vesuvius or Mount Pelee. In other words, they are investigating not only a volcanic island but a great submarine upheaval, 6,000 feet high.

ELECTRIC PEN TO BURN DESIGNS LATEST AID IN DECORATING

Operated by electric current from a house-lighting socket, a stylus pen now on the market is convenient for burning designs or lettering on all kinds of articles. It may also be used for embossing in gold, silver and other colors on fabrics, leather and other materials. Little skill is required as it is employed as an ordinary pen.





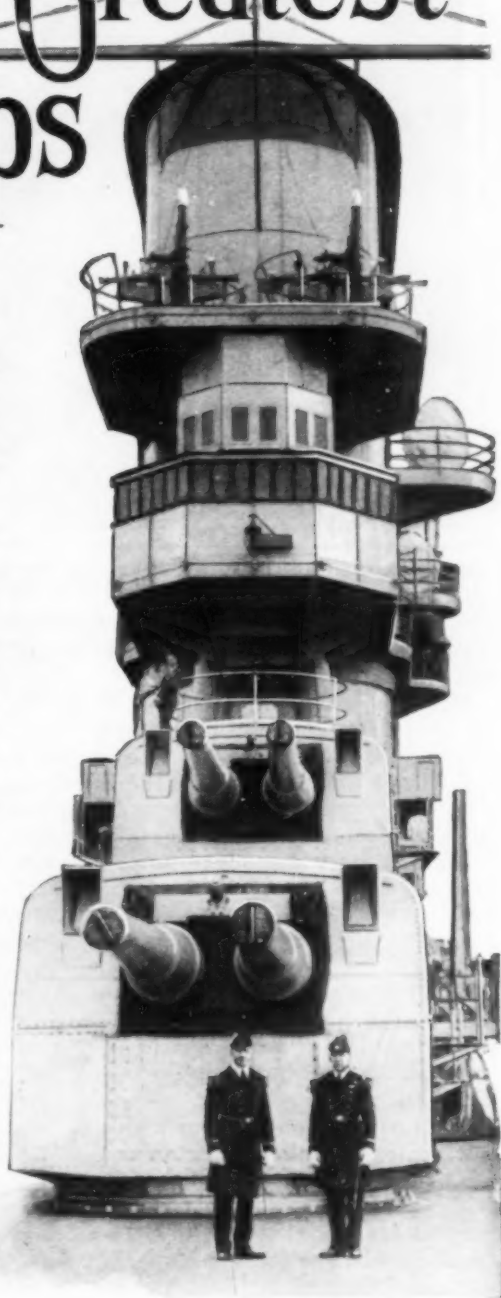
The "Saratoga" Lying at Anchor off Philadelphia Navy Yard, an Aerial View Showing the Enormous Flying-Deck Space; the Battleship with Cage Masts at the Pier in the Upper Left Corner Gives a Contrast in Size, For the Aircraft Carrier Is Almost Half Again as Long

The Nation's Greatest Ships

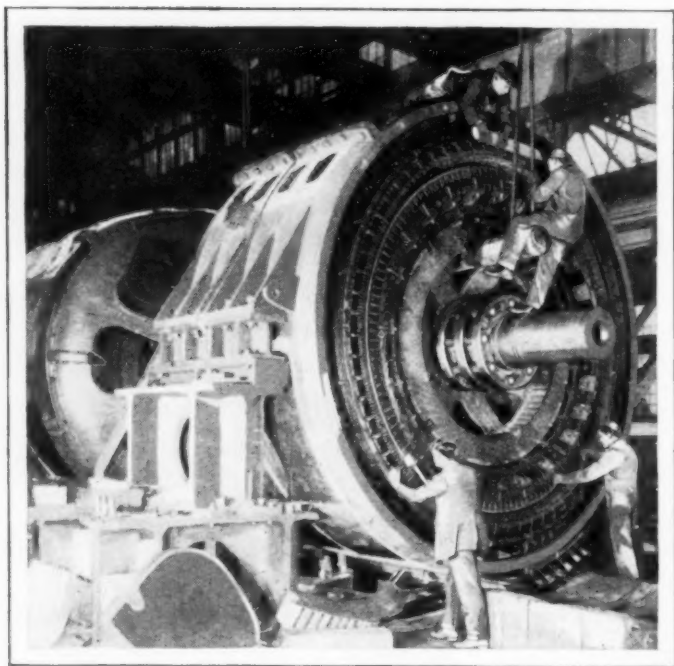
THE longest and most powerful naval vessels in the world have just been added to the American navy with the completion of the new aircraft carriers "Saratoga" and "Lexington." Built to tear through the seas at thirty-three knots, or about thirty-eight land miles an hour, each can put eighty-eight planes into the air, and at the same time carry on a respectable fight against an enemy on the sea or in the air, for each is armed with eight big eight-inch long-range guns and twelve five-inch anti-aircraft rifles.

Started at the close of the war as battle cruisers, the two ships were changed, after the Washington disarmament conference, into aircraft carriers of the latest type. With their superstructure condensed in tall towers on the starboard side and their smokestacks streamlined into a single unit, they are the weirdest ships in the navy. Bigger than battleships, but as fast as the lean gray destroyers, they are entirely different from anything else afloat. Their great speed requires enormous power, four electric generators, each of 35,200 kilowatts capacity, for each ship. The power of each vessel is sufficient to supply all the electrical needs of a city the size of Boston. Steam turbines, run by sixteen oil-fired boilers, turn the generators, which transmit power to eight enormous electric motors, each of 22,500 horsepower, connected in pairs to four propellers. With 45,000 horsepower driving each propeller, the combined output of 180,000 horsepower makes them the world's fastest big ships.

The navy's entire fleet of six electric-driven battleships now in commission—the "New Mexico," "California," "Tennes-



Turrets, Conning Towers and Smokestacks in One Tall Pile; Note Anti-Aircraft Gun, at Right, Pointing Up



Building the Giant Electric Motors Which Make the Two Aircraft Carriers the Most Powerful Ships Afloat

see." "Maryland," "Colorado" and "West Virginia"—has less power than either of the new ships.

Because of the concentration of all the superstructure, gun turrets and other above-deck equipment at the extreme right-hand side of the ship, the "Lexington" and "Saratoga" are balanced by placing their fuel oil, water and gasoline tanks in the hull on the opposite side. As each tank is emptied, it can be filled with water to keep the ship in trim.

The broad, long landing deck is large enough to drill a regiment on, for the ships have a length of 888 feet and a beam of 105 feet. At either end, the deck flares out over the hull, and also drops somewhat to increase speed when a plane takes off. The deck is equipped with arresting gear to stop a plane on landing within a few feet, instead of allowing it to run along for some distance, as is done on a land field. When the landing deck is in use life nets are rigged along the sides, so that members of the deck force can, if necessary, leap clear of the deck when a plane is landing.

Two levels below the landing deck, the ship has hangars and machine shops for

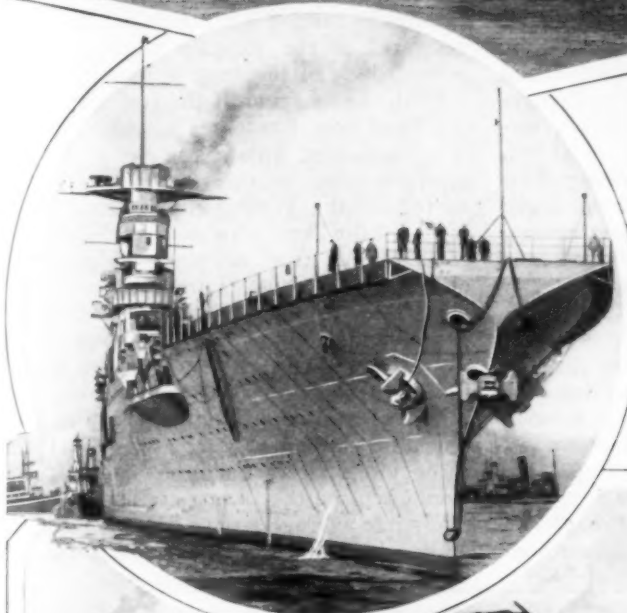
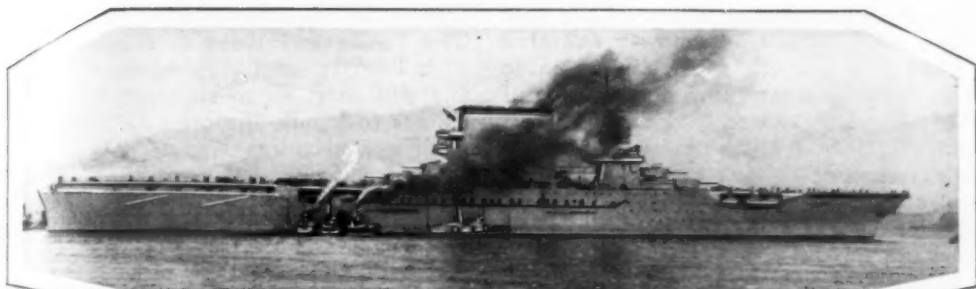
handling the eighty-eight planes, which include everything from light and fast observation and attack squadrons, to heavy bombers and torpedo planes. Huge freight elevators are built in, to lift the completely assembled planes to the flying deck, the elevators coming to a stop flush with the deck, so they act as part of the flying field when not in use. A new type of catapult, mounted near the bow, can launch seaplanes, while the flying deck is being used by both land planes and amphibians.

Either of the aircraft carriers, according to navy officers, is capable of meeting any existing battle fleet single-handed. With the eight-inch guns

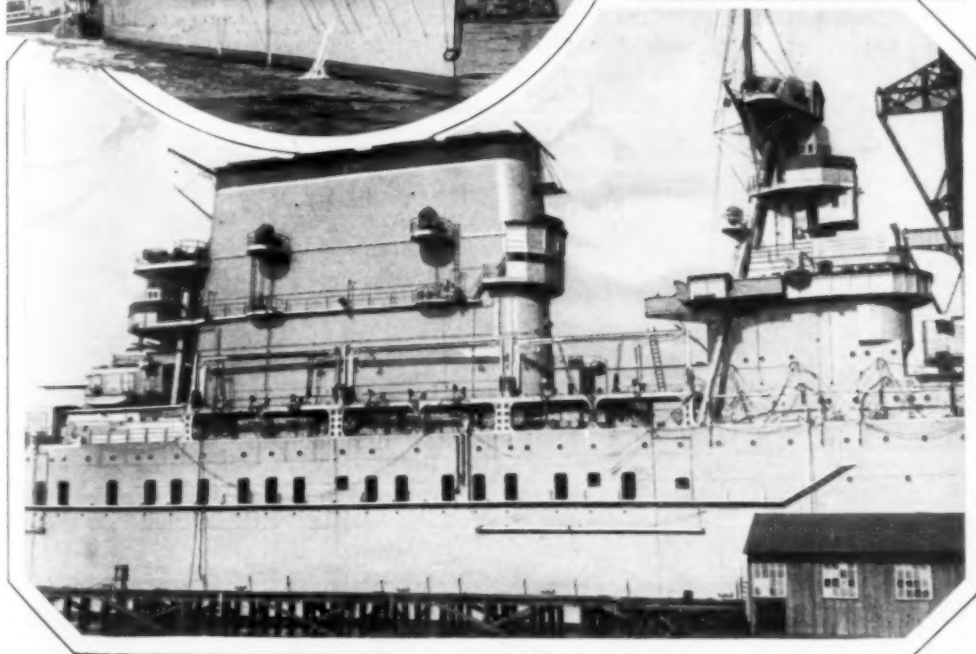
in their turrets, built for unusually long-range work, they can stand off enemy destroyers and cruisers, while their great speed will enable them to maneuver out of range of the heavier battleships. The twelve five-inch anti-aircraft guns are designed to keep the air clear of enemy planes while the carrier's own force is taking the air.

The flying deck is long and wide enough to accommodate the entire complement of set-up planes at one time, and still leave room for ships to take off. Not all of the eighty-eight planes on each carrier will be kept fully assembled at one time, but others can be set up as fast as needed, to replace airplanes shot down or incapacitated by mechanical troubles.

Some idea of the immense size, weight, power and speed of the "Saratoga" and "Lexington" can be gained by comparing them with other naval vessels. The 32,600-ton "Maryland," "Colorado" and "West Virginia," biggest battleships in the navy, are overshadowed by the aircraft carriers, with a displacement of more than 33,000 tons. The difference in size is even more marked, for the battleships, with their enormous weight of heavy armor



The Weirdest, Most Wonderful Ships Afloat; Three Views of the "Saratoga," Which, with Its Companion Ship, the "Lexington," Are the Navy's Greatest Vessels; the View at the Left Shows the Squared-Off Overhanging Bow, Wide Enough for Planes to Take Off or Land; Below Is a Closeup of the Conning Tower and Turrets and the Enormous Streamlined Structure Which Surrounds the Smokestacks; Note the Searchlight Platforms, Ladders and Walks Built on the Sides of the Stacks, and the Gun Turrets and Control Platforms Facing the Stern, at the Left of the Photograph



and big guns, are only 624 feet long by ninety-seven feet three and a half inches beam. The two new ships are each 264 feet longer—more than 40 per cent bigger.

In shaft horsepower either of the new ships, with 180,000 horsepower delivered to her four propellers, is equal to more than five 35,000-horsepower battleships of the "Maryland" class. Their enormous power will drive them practically as fast as the swiftest light cruisers in the fleet, and only two knots slower than the best of the first-line destroyer squadrons, while they can outrun the older torpedo boats.

Complete with her complement of planes, the "Saratoga" cost approximately \$45,000,000 to build.

The shops in the two carriers include not only machine and carpentry departments, but a laboratory for testing engines, fabric, doping and painting shops, a sheet-metal department, plumbing shop and a sewing shop with more than forty sewing machines, to work on wing covers.

The interior of the ships is divided into more than 600 water-tight compartments. Of these 117 are assigned to the supply department, thirty-one for the storage of aviation material, seventy for storage of general stores, and sixteen are utilized for the galley, bakery, butcher shop, general mess-issue room, clothing-issue room and the ship's store, or canteen.

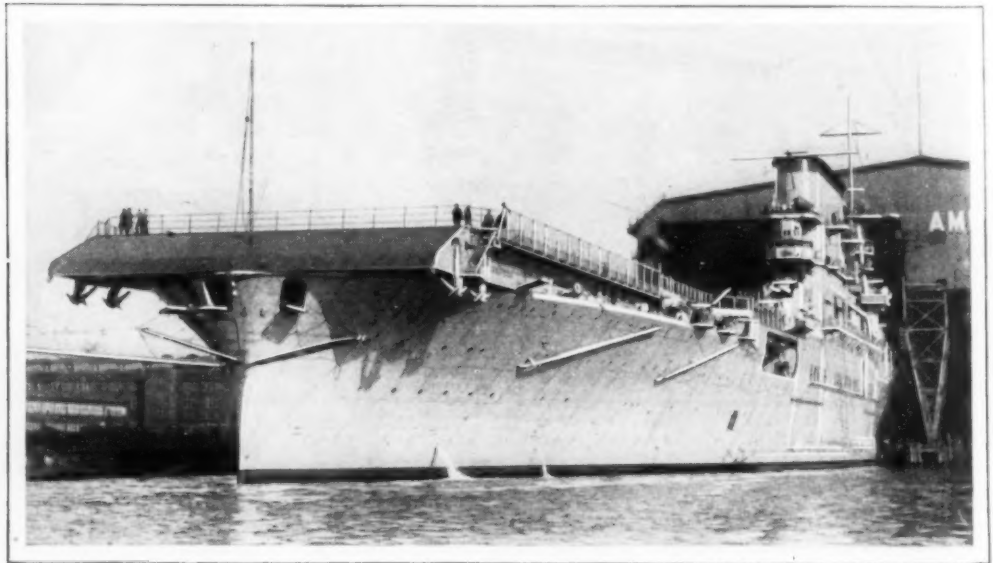
The crew's quarters are on the first deck below the flying field, with the planes stored below them, to give added protec-

tion against bombs dropped from above. The "Saratoga" went into commission with 1,365 enlisted men of naval ratings and 450 aviation mechanics; 104 ship's officers to handle the crew and 115 commissioned aviators.

Besides their usual equipment, each of the carriers has a complete weather-forecasting bureau, in charge of a weather officer and eight assistants. Every type of recording instrument used in land observatories is carried with their records concentrated in the weather bureau on the second deck of the superstructure.

With the addition of the two new ships, the navy now has three aircraft carriers in commission, but is still far under the total tonnage for ships of this type permitted by the Washington treaty, which assigned the American and English navies each 135,000 tons of plane ships. The other carrier, the "Langley," converted from the old navy collier "Jupiter," as an experimental ship, displaces but 12,700 tons, so 56,300 tons can still be added, though no more has been planned, as yet.

When President Coolidge submitted his recent navy plan to congress he included three more aircraft ships, one of which would replace the "Langley," giving them a possible average size of 23,000 tons each, or two big ships and one small one.



The Stern of the "Saratoga" Is Even More Odd Than the Bow; Four Anchors Hang from the Corners of the Flying Deck; Temporary Railing Is Rigged When the Deck Is Not in Use

RUBBER LIGHTNIN' CONDUCTORS GUARD DYNAMITE

In the Transvaal, where more people are killed by lightning than on any other part of the earth's surface; where electricity is so plentiful in the air that hair gives sparks when stroked; where whole mountain ranges consist of solid iron ore on which lightning dances like fireworks, the owners of explosive factories face an extra hazard. Though artificial caves have been hewn in the soil, and ordinary lightning conductors loom in hundreds against the sky which averages one thunderstorm every three days, the engineers who watch the black clouds that so often frown across wild Transvaal hillsides do not feel satisfied. Workmen put on rubber shoes and carry no metal that can produce sparks. As an additional protection, one large plant has been insulated with rubber. The great difficulty arose in giving the gutta-percha the power of "earthing" a current to the ground. Wires made of copper, iron, aluminum and other metals were let into the composition until a sensitive galvanometer showed that the electricity, although it was passing through the rubber conductor, could not leak toward the neighboring stocks of dynamite. This modern protection is flexible, consisting of rubber strips with the aforesaid metal reinforcement. It is mounted along the exposed edges of buildings.

TELEPHONE ON INFANT'S CRIB REDUCES MOTHER'S WORRY

To simplify the task of caring for the baby, a western inventor has devised a loud-speaker telephone apparatus to be attached to the child's crib. If the infant cries when the parents are in another part of the house, the sound is transmitted from a mouthpiece on the crib to an amplifying receiver in the living room.



Transmitter on Baby's Crib and the Loud Speaker through Which Baby's Cries Are Heard



Glasses Opened to Expose the Lenses; When Folded, They Can Be Slipped into the Pocket

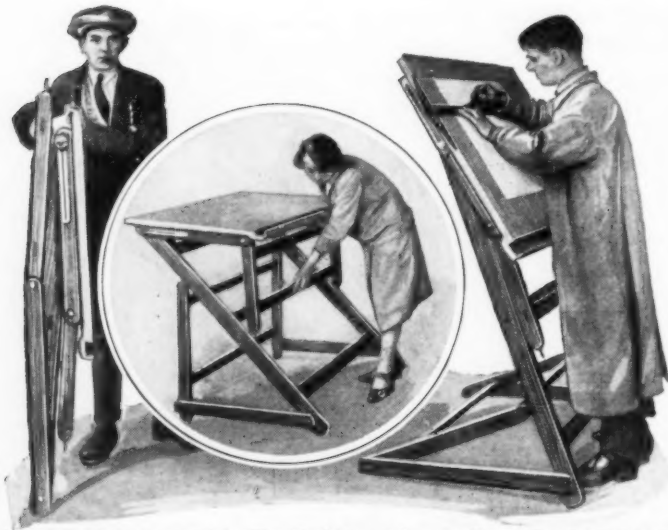
OPERA GLASSES FOLD FLAT TO FIT VEST POCKET

Easily carried in the vest pocket or the handbag, a style of opera glasses now on the market can be folded flat. The lenses are lowered and the case fits over them when the glasses are not in use.

A USE FOR OLD NAILS

Almost every land has its dealers in secondhand goods, but in France, where strict economies have been required because of the war's expense, salvage "specialists" are flourishing in large numbers. Among them are men who travel

from door to door, mending old china and other articles. Even the coarsest cooking utensils are saved instead of being thrown away, to await the arrival of the expert mender. Numbers of women are adept at weaving new bottoms in cane chairs. Even nails are hammered straight again and old pins made serviceable for further use.



Board Folded, Arranged in Flat Position, and as an Easel; Its Adaptability Suits It Especially to Small Studios

DRAWING BOARD IS ADJUSTED FOR ANY POSITION

For the convenience of draftsmen and artists, a drawing board introduced in France is attached to a collapsible frame which can be adjusted to a horizontal or vertical position with little trouble, and, when not in use, folds flat for storing in small space. In the upright arrangement, the board serves as an easel and allows the artist to work while seated or standing. There are no complicated parts to get out of order, and the outfit is so light in weight that one person can carry it without fatigue.

AUTO SHOCK ABSORBER KEEPS WHEELS ON GROUND



been placed on the market. It is designed so as to keep the wheels on the ground, thereby providing greater road traction,

Said to arrest spring vibrations and reactions from road irregularities without interference with the natural flexibility of the springs themselves, an improved shock absorber has recently

easier steering, longer mileage and better braking. It is easily attached to the free shackle end of the spring, and the balancing unit is pointed toward the axle.

CLEANER RESTORES SHEEN OF FUR

By adding a small proportion of paraffin to a preparation generally used for cleaning furs, investigators of the bureau of standards have improved the substance so that it is said to restore the original luster of the furs more thoroughly and is more effective in kill-

ing moths and other destructive pests. The treatment is considered an advance over usual dry-cleaning methods, as it does not mat the fur or make leather trimming brittle. The cleaner contains naphtha, to help kill moths, and the paraffin, used in small quantities, appears to restore the fatty content of the fur, often removed by dry-cleaning, and coats the hairs slightly, improving their sheen.

CALCULATOR TO BLEND OILS ELIMINATES GUESSWORK

To blend oils, a simple gauge has been introduced to save the use of a chart or special formulæ

and to insure an even grade in the product. It is an easily operated instrument, showing on one side the gravity calculations and, on the other, the viscosity scales. By moving a sliding member to the proper places on the scales, the necessary proportions can easily be determined. The guide is intended especially for those engaged in buying and selling, or experimenting with, oils.



ARTISTIC DISPLAYS ARE MADE FROM PAINT AND TIN



An electrically illuminated combination painting and zinc bas-relief, no deeper than the average framed picture but giving the perspective effect of countless miles, has been invented by a western artist for commercial displays. It is designed for the use of real-estate subdivision firms, chambers of commerce, railroads and motion-picture distributing organizations to visually present in a vivid, yet natural manner the attractions of their offerings. The inventor, Louis O. Leimert, uses a series of planes. The first, a piece of zinc, instead of inflammable canvas or wood, is cut out much like the familiar profile piece used in stage settings. This is then curved and, rising from the bottom of the front edge of the metal frame, is soldered in the foreground. The next, also curved and rising higher before being cut out according to the pictorial

Louis O. Leimert with Samples of His Metal Display Booths and at Work in His Studio; the Cabinets Are Effective for Real-Estate and Similar Exhibitions

requirements, is placed an inch or so back of the first, with succeeding pieces cut and soldered in place in a similar manner. The final flat piece of zinc, curved at top and sides to meet the front edges of the frame and thus mask off the rough edges from the sight of even the most critical observers, is introduced to form the background. Then miniature bridges, houses, trees, shrubbery, people and animals are carefully cut out by hand from small pieces of the metal and each soldered in place. After this, the metal frame is finished, all the metallic parts of the picture painted in perspective in natural colors, and sockets to hold concealed electric-light bulbs are fastened.

☞ Codfish devour clams, shells and all.



Eliminating Laborious Lifting; the Elevated Truck Body Extended to Simplify Task of Stacking Wood

AUTO TRUCK THAT PILES WOOD SAVES HAND LABOR

To simplify the task of hauling and stacking cordwood, a Seattle dealer devised an elevating body for his auto truck. It can be raised to a height of more than eleven feet, remaining level during the descent and permitting easy stacking of the load as well as refilling the truck from the top of the pile.

HUDSON BAY ROAD WILL END AT CHURCHILL

Engineers have chosen Churchill instead of Port Nelson as the Hudson Bay terminus of the railroad that is expected to save wheat growers, and other producers in the central provinces of Canada, large sums in freight charges. Although Churchill is 100 miles to the north, it is about the same distance from Liverpool, and the advantages of the natural harbor there, over the artificial one that would have had to be constructed at Port Nelson, proved a deciding point in favor of the new location. Work was started on the railroad several years ago, was abandoned during and for some time after the World

war, but was started again last summer. It is expected that trains will be running into Churchill by the fall of 1929. The line runs through muskeg which is frozen, even in midsummer, to within a foot or two of the surface. This makes it impossible to do any work with steam shovels. Pick, shovel and wheelbarrow must be used instead. Construction of the road is being done under great difficulties, and the results are doubtful in the minds of many engineers, for they point out that not more than two months of the year are open to navigation through the straits. But believers in the project will rely to some extent on two modern aids in defeating this obstacle, directional radio and airplane scouting to help guide the ships.

TRAINS AS POLITICAL POSTERS SPREAD RUSSIAN IDEAS

Spreading propoganda by means of railway trains "dressed up" as posters, is one of the plans adopted recently in Russia. Banners and other insignia are attached to the engine and the message is spread to every town and city along the way. Some of the poster trains literally travel



All Dressed Up in Propaganda Costume; a Russian Locomotive That Serves as a Traveling Poster

the length and breadth of the land and are seen by thousands of persons.

Right This Way Gentlemen



By SAM BROWN

EVERY spring hundreds of street shows start their migratory tour of the "sticks," bringing with them a host of sure-thing games on which you can try your skill. Many of them, from the innocent-looking "Toss a ring and win a cane" game, to the intricate roulette and paddle wheels, can be "gimmicked" or controlled by the operator.

One of the most ingenious of these games is the "Test your strength" device, wherein a lever, when struck by a hammer, catapults a marker up a steel wire and registers the number of pounds of strength. A blow of 2,000 pounds rings a bell and the strong man is awarded a couple of cigars. The operator controls this game in the majority of cases. At his feet is a lever which only needs a gentle touch and—presto!—the wire is made to hang taut or loose as he desires. And therein lies

the secret. When the wire is tight, a moderate blow will shoot the marker skyward, lighting the colored marking bulbs all the way to the final crash on the bell; but when the wire is loose, the marker encounters considerable friction, and even a Samson smash will fail to register any more than 1,700 or 1,800 pounds.

Perhaps the commonest of all the carnival games is the roulette or paddle wheel. Most of these are run on the square, the operator depending on getting a full board on every spin of the wheel, and then awarding a sixty-nine-cent prize to one of the fourteen people who have paid a dime each for the chance of winning. But most of the manufactured roulette and paddle wheels can be fixed, and the percentage of winnings altered instantly by the operator. There are many ways of controlling these wheels. Usu-



Tossing a Ball into One of a Group of Buckets Looks Easy, but the Operator's Foot Decides Whether the Ball Stays In, to Win, or Bounces Out

ally a cunningly hidden nail or lever below the betting board has direct connection to the hub of the wheel, either by friction or by electricity, giving the operator full control.

Even the innocent-looking rings which you try to toss over the head of a cane may be fixed. This is done by weighting the ring on one side so that it falls on an angle, thereby preventing it from ringing any but the cheaper prizes, while the ten gold-headed canes, with the dollar bills wrapped around their handles, remain the property of the operator.

Another ring game offers prizes mounted on pedestals, the object being to throw a hoop over the pedestal in order to win the prize mounted on it. The "shil" does it with a special set of slightly larger rings which are kept on hand for his appearance, but the rings you play may be a bit elliptic in shape, and since this slight variation from a true circle makes them about one thirty-second of an inch smaller

than the pedestal, you might toss a lifetime without getting anything. If you should look askance at the ring and then at the pedestal, the operator will take the ring, and, pressing it to a more rounded fullness, easily slip it over the stand in question.

Another game which looks absolutely on the square is the pin-and-ball game, consisting of a bowling pin standing on a table, with a suspended ball directly over it. To win in this game, all you need do is to swing the ball forward, miss the pin going, and knock it down coming back. An impossibility! If the ball is suspended squarely over the pin, it is against all laws of gravity for an object its size and weight

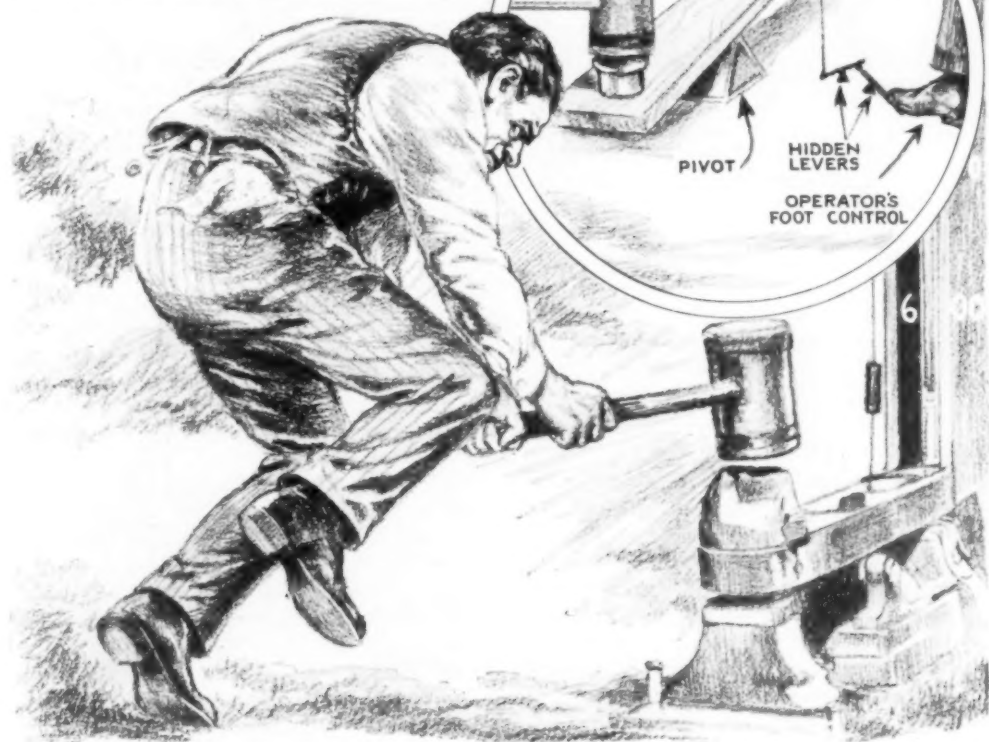
to miss the pin going and hit it coming back. When the operator demonstrates, he presses a lever which sets the ball about a quarter of an inch off to one side, and then with a practiced hand, knocks down the pin on the rebound. After his "See how easy it is" demonstration, the ball goes back to its former position and your efforts only go to show that Dame Nature cannot be trifled with—not even for a ten-cent piece!

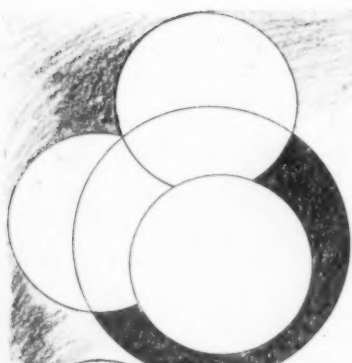
There are a few games that are always played on the square. One of these is the "Spot it" game. To win you must lay down five small red disks so that they completely cover a larger blue one. The operator shows you how. Your trial, however, usually results in a contribution to the barker's pocketbook. This game is a real game of science—the science of geometry. The sketch shows you the only way the small disks can be placed to completely cover the larger one, and any deviation from this layout, be it only a quarter of an inch, will result in failure. It's not so honest after all! The operator has certain

landmarks on the blue disk, discernible only to himself, without which he, too, would be unable to make the five red disks cover.

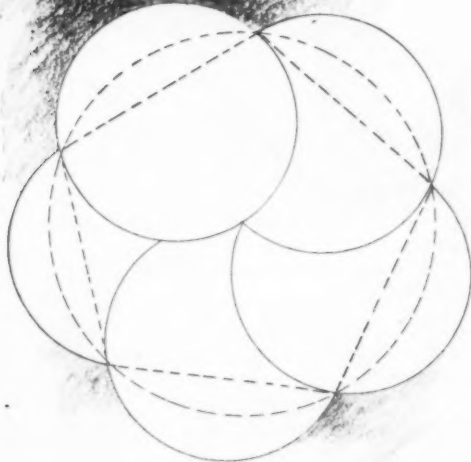
The gimmicking even extends to the guileless-appearing ball games. The woeful-looking cats and the pretty white milk bottles that you throw baseballs at are often loaded so that they can withstand a most terrific impact and still remain vertical. The grinning "nigger babies" have been hammered so unmercifully in previous seasons that they present a total solid area of about three square inches, the rest consisting of gaudy

Whether the Wire Is Taut or Slightly Loose, as Determined by a Foot Lever, Decides Winners and Losers





THE PROBLEM OF "SPOT IT" IN WHICH THE LARGE DISK IS TO BE COVERED BY FIVE SMALL ONES. ABOVE, THE WRONG WAY, AND, BELOW, THE SOLUTION



edging through which the ball whizzes without the slightest effect. You cannot throw a ball into the mouth of a grinning face because the operator presses a button which closes the mouth a trifle, making it too small for the ball.

One of the surest of all the sure-thing games is the one with the buckets. To win a prize at any of these bucket games, you must throw so many balls into the buckets in so many tries. Try and do it!

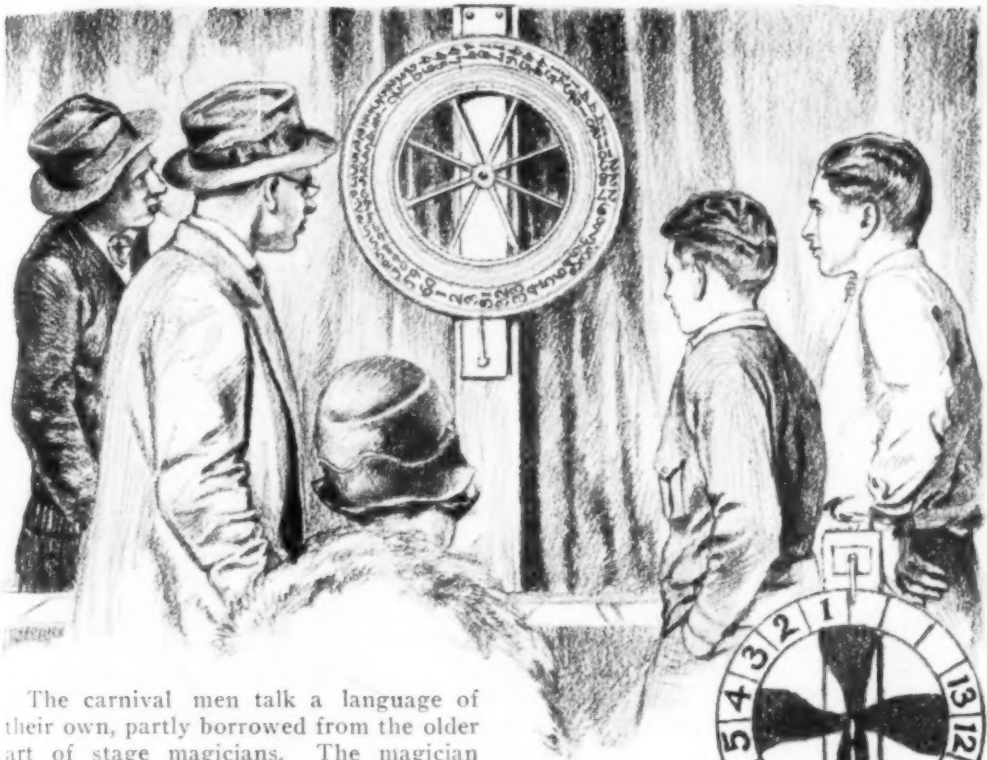


Method of Covering the Entire Surface of One Large Disk with Five Smaller Ones Is Shown at the Left

The buckets are all guaranteed by the manufacturer to reject the ball every time it is thrown in. The only time anybody wins is when the operator thinks that a winner would be good business; then he presses the lever which takes the bounce out of the bottom of the buckets and somebody gets a prize. The winner is complimented on being a very skillful individual. Were you ever one?

There are many variations of the carnival games. The knife pitch, for example. It is basically the same as the cane pitch, in which the player tries to toss the ring over a cane, and fails because the ring is slightly weighted on one side, causing it to fall at an angle that makes it practically impossible to land it over the end of a walking stick.

The shil who runs the knife pitch displays several hundred pocketknives, opened and with their blade tips stuck into his table. It looks like an easy thing to land a ring over one, but all the more valuable knives are so closely placed that the weighted ring is sure to strike on one edge and fall between them, and the chance of putting a two-inch ring over the cheaper ones is slight.

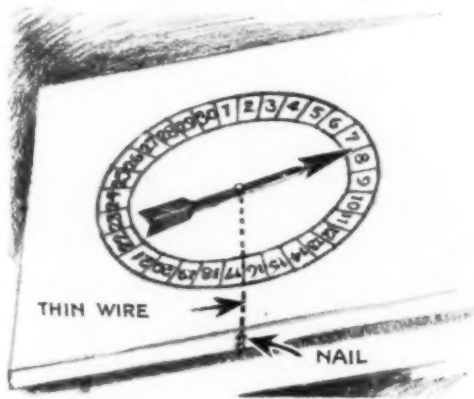


The carnival men talk a language of their own, partly borrowed from the older art of stage magicians. The magician calls the secret, hidden apparatus that enables him to fool the eye a gimmick and the shills have adopted the same term.

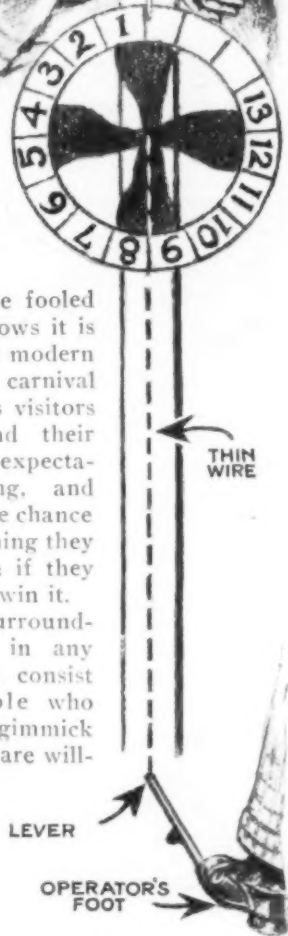
Strangely enough they do not mind particularly if the public knows the games are fixed for the house to win. They discovered a long time ago that the older gambling games, three-card monte and the shell racket, which were looked on with disfavor by the law, were very crude.

Profiting by Barnum's dictum that the public likes to be fooled even when it knows it is being misled, the modern shill plays on the carnival spirit that makes visitors willing to spend their dimes with no expectation of winning, and spend them on the chance of getting something they don't want, even if they are permitted to win it.

The crowds surrounding the games in any amusement park consist largely of people who know there is a gimmick in the game, but are willing to spend the money for the amusement derived from the play. A carnival



Friction of a Thin Concealed Wire on the Hub of a Spinning Wheel May Be Used to Make Blanks Win



man with a "fixed" device is selling an amusement as frankly as the operator of the figure eight, and if, occasionally, he condescends to throw off the gimmick and let a player win a violently painted plaster-of-paris vase, a crepe-paper-dressed doll or some equally eye-start-



the evening. These are some of the conclusions of a University of Chicago research worker who has been alternately fasting and eating for more than 500 days in an effort to solve some of the mysteries of hunger. At one time, he went forty-one days without eating. He believes



Two of the Games That May Be Fixed; the Suspended Ball Which Must Hit the Pin on the Return Journey, and the Weighted Rings That Always Fall at the Wrong Angle

ling prize, it is merely a favor bestowed, and not something legitimately won.

The fiction that the games are ones of skill and not of chance, and therefore not violations of the anti-gambling code, is maintained but outwardly. The shill knows his customers come to be amused, and that they expect to get their fun out of his conversational sallies and their own futile attempts to beat the game.

EATING MOST FOOD IN MORNING HELPS REDUCE FAT

Persons desiring to reduce their weight should eat more of their food in the morning, while those who wish to gain in weight will be benefited by heavy meals in

that hunger is caused, not by the contraction of the walls of the empty stomach, but by conditions of the cells in the major food depots, such as the liver, the lymph and the blood. Instead of being a true sensation, in the usual meaning of the word, hunger, he declares, is more of a motor than a sensory phenomenon. That is, it compares with the impulse to breathe. The investigator found that he could not localize the feeling of hunger. Real hunger is usually experienced fifteen hours or so after eating. If the heartiest meal is eaten in the morning, this hunger occurs during sleep and is not noticed, but if the subject has dined heartily at night, he will feel the pangs of hunger late the next morning and so has an appetite for an-

other heavy meal. During his tests, the investigator found that sound sleep was difficult after a few days of fasting.

FOLDING AUTO TOP INCREASES COMFORT

To permit greater enjoyment of the automobile for touring and camping purposes, the tops are being built so that they can be more quickly adjusted for converting the car from a closed to an open vehicle. This has been accomplished in two automobiles introduced in England by a folding and a sliding roof. The arrangement makes it unnecessary to remove side panels or otherwise alter the main top supports. In one, the upper part of the top is simply lifted back and folded away on braces like those of the ordinary folding top, and in the other, the roof is a panel affair with the front or rear part sliding over or under the other, leaving the top open over half of the automobile. The changes are quickly made and greatly add to the pos-



Auto Top Lifted Out and Being Folded Back So That Occupants May Enjoy a Less Obstructed View

sibilities of the car for sleeping purposes or as a room while camping.



"Wooden Soldiers" on Parade; Members of an Elks Lodge Wearing Spruce-Tree Costumes during a Celebration in Aberdeen, Wash.

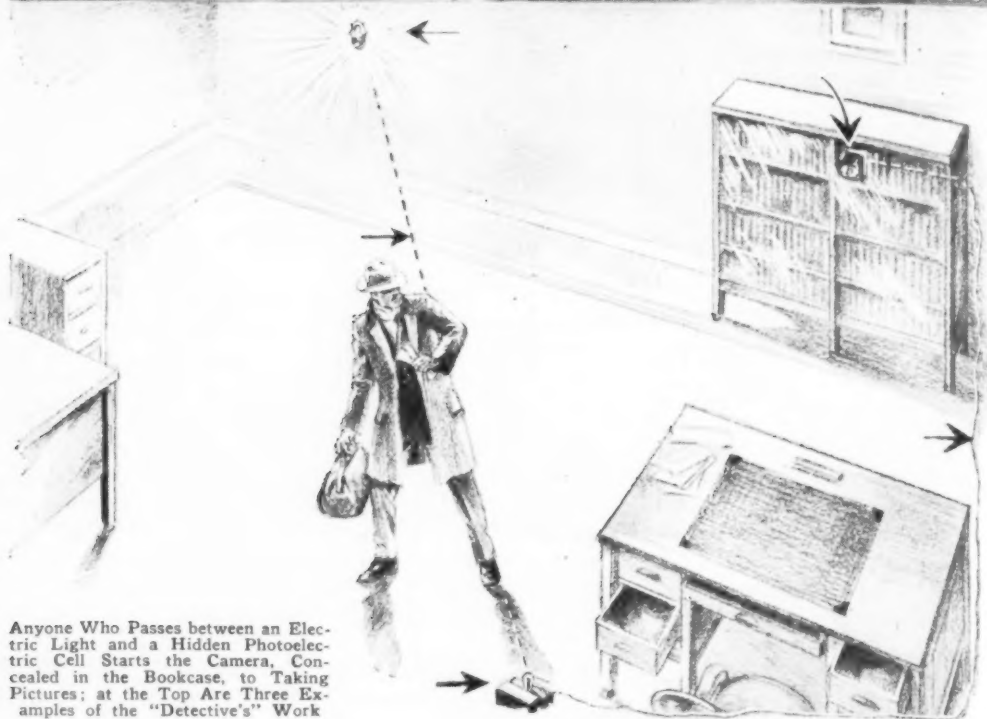
TREES ARE WORN AS UNIFORMS IN NOVEL PARADE

What appeared to be animated logs were seen on the streets of Aberdeen, Wash., during a recent Elks' celebration, as members of the lodge, wearing spruce tree cores that almost completely covered them, staged a parade. The cores are the remaining portions of the logs after the strips of veneer have been removed. They were provided with inside straps for carrying and holes were cut for the eyes.

TELLTALE CLOCKS IN SUBWAYS REPORT ACCIDENTS

One of the chief difficulties in the operation of an underground railway is that mishaps are likely to be undiscovered by the outside operators for some time and there is often confusion in locating the exact spot where an accident has occurred. To remedy this, a London subway has installed a clock arrangement on which the passage of trains is registered automatically, so that any gap in the service is quickly detected. To supplement this unit, the main control office is being equipped with registers which will show the cause of the accident and where it happened.

INVISIBLE EYE IS LATEST TERROR TO CROOKS



Anyone Who Passes between an Electric Light and a Hidden Photoelectric Cell Starts the Camera, Concealed in the Bookcase, to Taking Pictures; at the Top Are Three Examples of the "Detective's" Work

An invisible eye that winks at every movement made by a person in its neighborhood, and at every wink takes his picture, has been perfected by a Rochester, N. Y., inventor, to furnish positive identification of the criminal even though he escapes from the scene of his crime. The invisible eye is a hidden camera, loaded with a magazine capable of taking 160 pictures, and controlled by a beam of light falling on a sensitive photoelectric cell. So long as the light continues to shine on the cell nothing happens, but if an intruder passes

through the beam, the camera immediately snaps his picture. Putting out the light to foil the camera is useless, for then it takes continuous series of pictures until the film is exhausted. In the inventor's office, the camera, a small bullet-proof steel box, measuring six by nine by three inches, is hidden in the drawer of a filing cabinet. A small aperture, less than an inch in diameter, opens in the front of the camera for each wink, and then closes, to hide the lens. Several of the cameras have been installed, one in the mayor's office in an

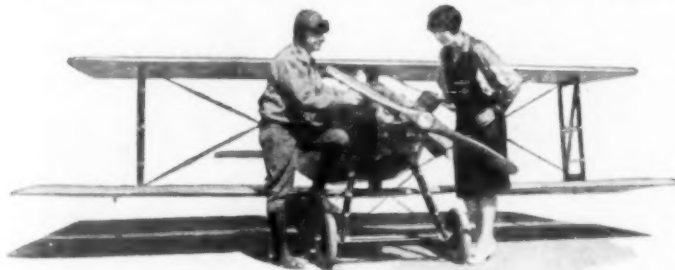
eastern city, with a push-button control that permits the mayor to snap every visitor without the guest knowing he is being photographed. In another installation, the camera is hidden in what appears to be a book.

MANY USES NOW FOR SAWDUST

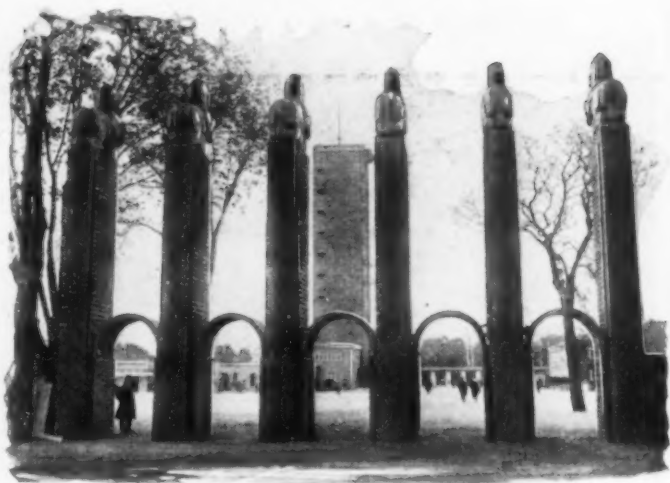
While large quantities of sawdust are burned as waste here, this country imports thousands of tons of the same material from abroad, according to the department of commerce, pointing to the need of further development of salvage. Because of the many uses to which sawdust can now be put, it should be termed "non-utilized" wood instead of waste, according to investigators of the subject. About ten per cent of the average saw log is converted into sawdust during the manufacture of lumber and, recently, large sums have been spent in developing profitable uses for this material.

HIGH-SPEED MIDGET AIRPLANE FOURTEEN FEET WIDE

Although it has only a twenty-horsepower motor, a small airplane built by a western company has developed a speed of 140 miles an hour over a measured course. Its wing span is but fourteen feet. The midget ship was constructed for racing and exhibition purposes only.



For Racing and Exhibition; the Midget Plane with Fourteen-Foot Wing Spread and Twenty-Horsepower Motor



Unusual Gate Posts and Arches at the Entrance to the Theater Grounds at Magdeburg, Germany; the Materials Are Brick and Concrete

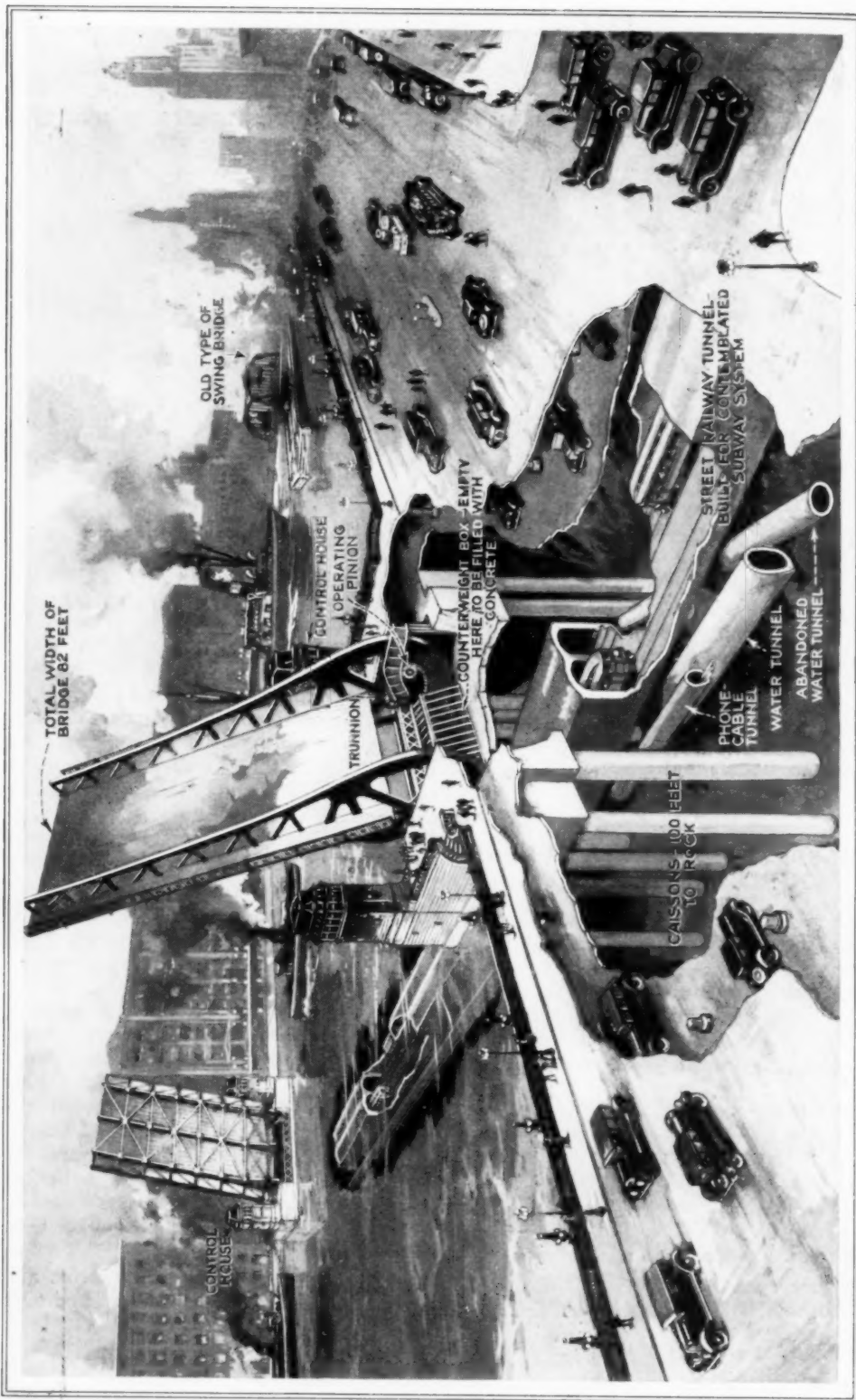
LATEST STYLE IN ARCHITECTURE SEEN IN GERMAN THEATER

Tall towers, slender arches, flat roofs and a gate featuring the figures of horses as the chief decoration are among the architectural expressions in a theater at Magdeburg, Germany. Brick and concrete are the principal materials used, and units of the structure are made more distinctive by the fact that a large building lot was available, permitting greater display than is usually practical where theaters must be erected within restricted space.

DOCTOR ANSWERS DOOR IN BED THROUGH LOUD SPEAKER

So that he does not have to get out of bed to answer the doorbell at night, a loud-speaker system has been installed for a London physician. There is a microphone at the door for the caller to use. When this is removed from its hook, a buzzer sounds by the doctor's bed and he can talk with the person outside through a telephone and a loud speaker fitted over the front door.

☞ Tortoises live on land and turtles in the water.



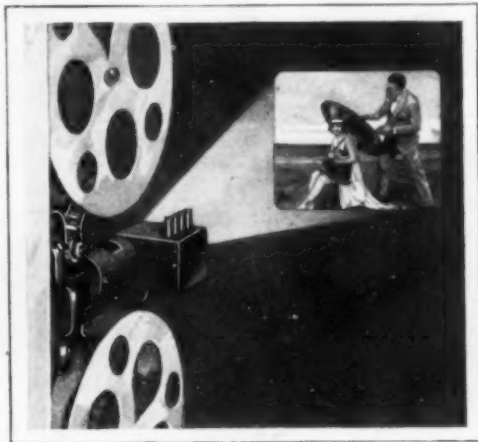
Artist's Drawing of the LaSalle Street Bascule Bridge in Chicago as It Will Appear When Finished; the Street Is Cut Away to Show the Relative Positions of the Bridge Foundations, Subway and Other Details

BRIDGE BUILT LIKE A WATCH IS ENGINEERING FEAT

Building a bridge up in the air, half of it at a time, then tipping the two halves together and making them meet within a fraction of an inch, is the task of Chicago engineers. And they are doing it directly over a subway under the river, where people ride through in street cars. Each leaf of the bridge rests on a 100-ton truss, supported on caissons that reach down to solid rock. Constructed almost as accurately as a watch, exactness to the one-thousandth of a foot is observed in assembling the parts and, although each of the big leaves weighs approximately 1,950 tons with its counterweight, they are so nicely balanced that a gang of men could pull them up by hand. As it is, two 100-horsepower motors are provided for each leaf. They can raise the bridge in three-fourths of a minute. In the finished bridge, the controls will be regulated so that the operator cannot release the center lock that holds the leaves together until the safety gates are down on each side. The bridge will cost approximately \$1,600,000. It will have a roadway fifty-six feet wide with two walks for pedestrian traffic on either side.

COLOR ATTACHMENT ON MOVIE HELPS REST EYES

Colored movies in the home are now possible with the aid of a simple attachment. It is merely a box of colored lenses which can be interchanged and combined to form as many as fifteen different hues. The glasses are put in operation and released by pressing buttons on the side of the attachment. It is said that the unit not only adds to the enjoyment of the pictures but helps relieve the strain on the eyes.



Color Attachment on Home-Size Movie Projector; Note the Buttons for Changing the Effects



Automatic Oiling Unit to Keep Cables in Good Condition and Prolong Their Life

OILER PROLONGS CABLE'S LIFE AUTOMATICALLY

For steam shovel, drag line, elevator and other rigs, an automatic cable oiler keeps the line in a thoroughly lubricated condition to prolong its service and decrease the likelihood of breakage. It operates equally well in a horizontal, vertical or angular position, according to reports, and consists essentially of a holder for the oil with rollers that permit the cable to slip along easily to receive the proper amount of lubricant. Excess oil is wiped off, and there are rollers to prevent the cable from rubbing on the end of the oil container. Economy of lubricant is another feature that is claimed for the unit.

Our Bureau of Information will answer all questions regarding articles in this magazine.

TIME and MONEY



To Recondition Furs, Fine Wire Brush Is Bent to Such an Angle That It Catches Dust and Dead Hairs; Treatment Gives a Gloss and Prolongs Life of Furs



Courtesy Richard E. Thibaut, Inc.

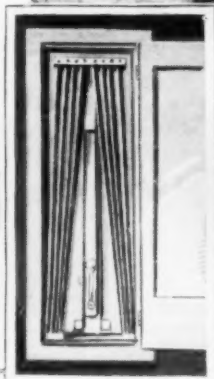
Wallpaper Pictured Above Is Safely Washable as It Is Coated with a Film That Seals the Pores; Suitable for Hotels and Can Be Easily Removed



It Quickly Cleans Dirty Pans; a Steel-Wool Pad on Convenient Handle



Can Be Carried in the Pocket or Handbag and Folds into a Rosette; a Waterproof Covering for the Hat



A Clothes Rack in Your Kitchen Wall; This Folding Unit Has Large Capacity and Is Out of Sight When Not in Use

SAVING THINGS for Your Home



Rotary Fruit and Vegetable Press Quickly Removes Skins and Seeds without Soiling Fingers



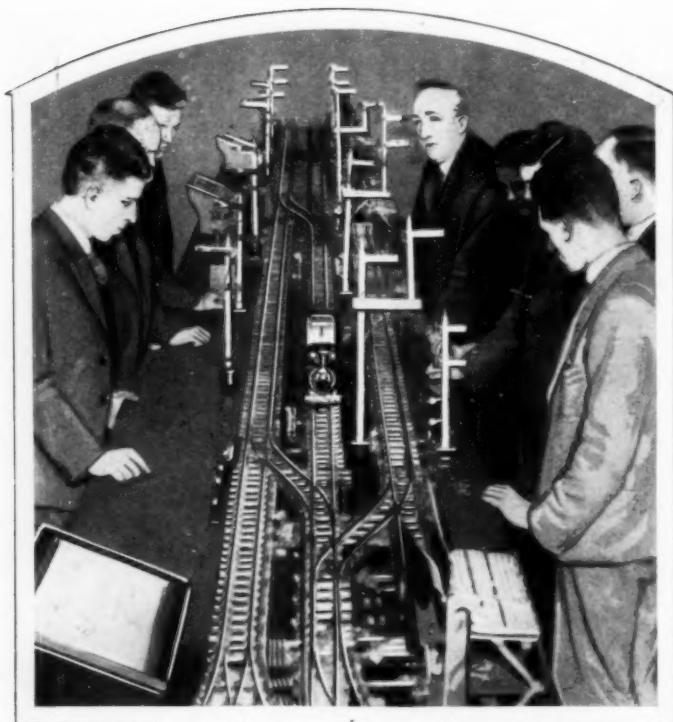
Sliding Broiler Drawer for the Gas Stove Saves Reaching into Hot Oven and Stopping



Complete Manicure Set in Holder No Larger Than a Pocketknife; It Includes Buffer, Powder, Polish, Nail White, File, Emery Board, and Manicure Stick; Refills Are Easily Obtainable



Push the Back of This Comfortable Chair Down and You Have a Bed. Seventy-Two Inches Long. Big Enough for One Adult



Railroad Class at the Model Operating Board; Tiny Signals Are Worked in Same Manner as Real Ones for Solution of Problems

MODEL RAILWAY FOR TRAINMEN AIDS IN TRAINING

Candidates for positions with a London railway company receive helpful instruction in various duties by using a model railroad. It is built closely after the real lines, with small signal towers, switches and other units that are operated in much the same way as the actual equipment. The outfit is used for demonstrating various details of operating.

MIRROR IN AUTO-DOOR VISOR AIDS IN PARKING



Many auto drivers have experienced difficulty and sometimes embarrassment in being arrested as a result of parking too far from the street curbing. This trouble is

eliminated with the aid of a visor over the door which not only serves as an efficient shield for the eyes in all sorts of weather but also contains a mirror so that the driver can tell just how far he is from the curb. The visor has curved ends that keep rain from blowing in, provides ventilation without draft and can be installed in a few moments.

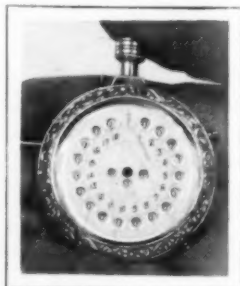
ACID TO CLEAR RUSTY PIPES

Water pipes in a thirty-five-story building in New York were recently cleared of rust by using an acid solution, saving the expense of costly re-piping. The feature of the process was that a substance had been added to the acid to prevent it from corroding the pipe while attacking the rust.

This has been the chief drawback to the use of acid in treating rust-clogged conduits, but the special material eliminated this difficulty.

"CLOCK" TO KEEP GOLF SCORES HELPS PREVENT MISTAKES

Record of the number of strokes for each hole as well as the total for the course is kept on a scoring dial recently introduced for the greater convenience of golfers. Each hole's requirement is tallied in a separate space around the dial of the instrument and the total is shown in the center. By pulling a release switch, the indicators go back to zero at the end of the game. The scorer is simply constructed and will last indefinitely, it is said.



ENGINEERS SEEKING WAY TO SAVE NIAGARA FALLS



Miniature Niagara Falls Built to Study Conservation Problem, and Aerial Photo of Horseshoe Falls, Showing Crest Lines of Past Years

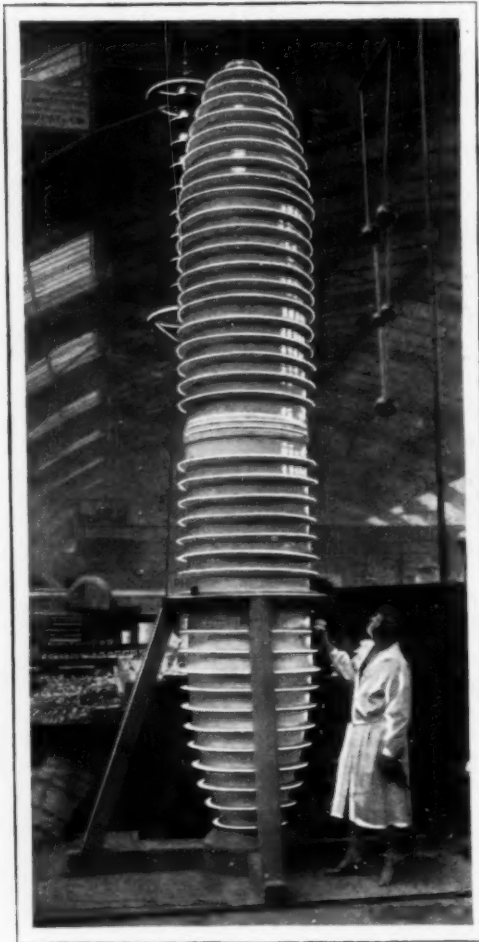


Whether Niagara Falls can be stopped from committing suicide through the constant erosion that is gradually eating away the famous Horseshoe falls, may be solved by experiments being made with an actual scale model built in an open field by the Niagara Falls Power company. The model not only shows the present position of the falls, but indicates the old crest of the Horseshoe as it was in 1764 and in 1842. The threatened suicide of the falls is due to the fact that after centuries of constant movement up the stream, during which the crest has moved seven miles, the falls have finally emerged from the narrow gorge and are constantly broadening, providing a wider front over which the water must be spread. Power-company engineers figured that through remedial works above the falls to divert the flow and spread it evenly over the face of the precipice, it would be possible to lessen the

volume of water, and, therefore, decrease the amount of erosion. The model illustrates the effect of weirs placed in the river or the alternate proposal of building a chain of small islands above the Canadian falls to break up the flow.

DOUBLE-GLASS PRISMATIC SIGN SHOWS LETTERS CLEARLY

Especially suited for street signs or warning markers, a double glass is said to reflect the light so that the letters stand out clearly and are visible at considerable distance. The characters are left clear, the top glass being painted. The back panel is of a prismatic nature and is silvered.



To Keep 500,000 Volts in Check; Huge Insulator Exhibited at Recent Exposition in Germany

HALF-MILLION-VOLT INSULATOR SHOWS ELECTRIC PROGRESS

One of the features of an exposition in Germany was a huge insulator adapted to a 500,000-volt power line. The collection emphasized the huge size of various machines required for modern industry and the insulator indicated that the development of electric power has kept pace with other activities.

HUMAN DREDGES IN SUMATRA CHEAPER THAN MACHINERY

Americans are so accustomed to thinking of huge machinery, capable of doing the work of a multitude of men, as being money-saving inventions, that it is hard

to realize that any place exists where human labor is cheaper than mechanical aids. In Sumatra, Dutch East Indies, chiefly noted for its fine tobacco and rubber plantations, labor is so cheap that it can even compete with deep-sea dredges. Harbor improvements recently made at Bencoolen, Island of Sumatra, were carried out by Malay divers, who went to the bottom, gathered up pieces of shale, one at a time, and carried them to the surface, where they were placed on bamboo rafts and propelled by poles out of the harbor. The soft shale was removed to deepen the harbor to enable vessels of twenty-five foot draft to enter. Dynamite cartridges, tied with rags and weighted with stones, were exploded on the bottom, and the swarms of native divers then did the rest of the work. Ordinarily the harbor is frequented by man-eating sharks, but the dynamite killed many and scared the rest away.

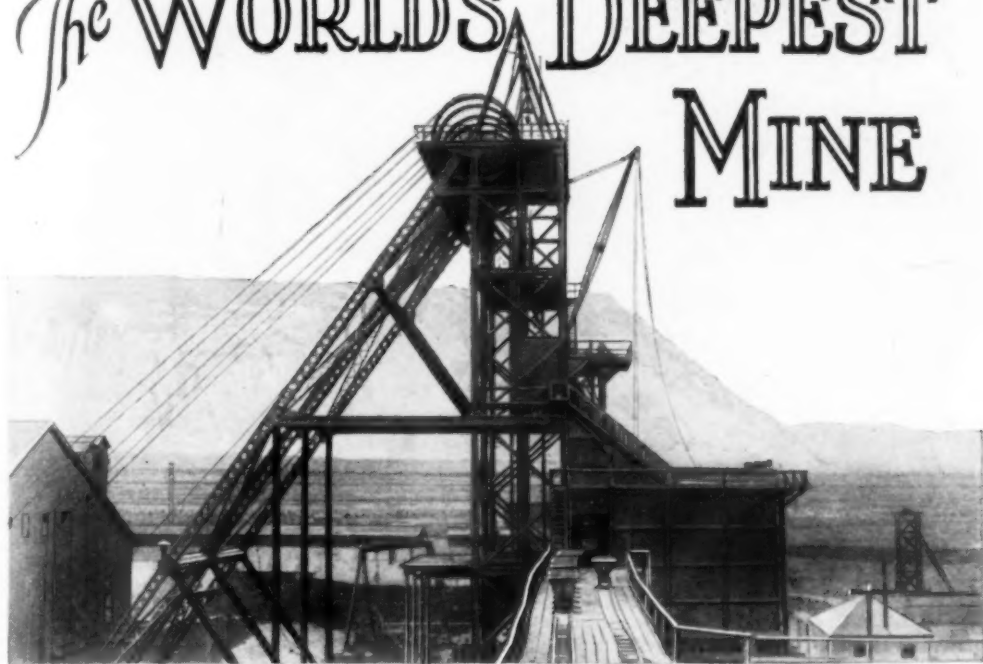
ADJUSTABLE CHART OF STARS AIDS STUDY OF ASTRONOMY

A "pocket-size" planetarium has been introduced recently, mainly for the amateur astronomer who likes to pursue his studies with accuracy and convenience, and yet does not have the advantage of elaborate instruments. It is essentially an adjustable chart, showing the positions of the stars, and there are interchangeable disks for the better observation of the fixed and moving bodies.



For the Amateur Astronomer, an Adjustable Chart of the Stars with Interchangeable Disks for Observing Fixed and Moving Bodies in Their True Relation

The World's Deepest Mine



The Hoisting Gear of the World's Deepest Mine, the White Mountain in the Background Is 10,000,000 Tons of Ore from Which 125 Tons of Gold Have Been Extracted

By THOMAS PHELPS

ONE cold morning in July two of us, looking like soldiers in tin helmets and army greatcoats, stepped into a steel box suspended over a hole in the ground by a meager-looking cable, and in eighteen minutes were farther inside the world than any living human being ever had been before, because the Village Deep gold mine at Johannesburg, South Africa, already almost a mile and a half deep and scheduled to reach 8,000 feet below the surface this year, is the world's deepest.

Digging the Village Deep (and getting out the gold en route, about 125 tons so far) cost \$60,000,000 and twenty years of hard work. The top of the mine is simply a lofty headgear, from which hang six cages, or hoists, like baskets on strings. Each has a capacity of five tons. The two man hoists, three-story cages with a capacity of forty men each, run on schedules like trains. Every day they carry 3,000 natives and nearly a tenth as many whites a mile underground and back again.

My guide, a dust inspector, ushered me into one of the hoists and we dropped into darkness, noiselessly save for the rush of air and the faint sing of the cage on the steel guide rails, picking up speed until I began to think we must have missed the bottom altogether.

"Three thousand feet a minute (roughly thirty-five miles an hour) is the fastest the law allows them to run the man hoists," said a voice in my ear. "The rock hoists go 3,800 feet a minute."

Just eighty seconds from the top the cage stopped, with a soft, springy motion that took us up and down three feet or more.

"Good shock absorbers," I observed.

The inspector laughed. "That's the stretch of the steel rope you were looking at up above," he explained.

The door opened upon a busy street and switchyard, all about as dark as a white way at midnight. Natives, clad only in loincloths, were dumping small railroad



Courtesy South African Railway

Half a Mile Underground in a Witwatersrand Gold Mine; the Gold Reef Is More Than Sixty Miles in Length and Extends, in an Inclined Plane, More Than a Mile and a Half Deep

trucks full of ore into bins on either side of the elevators, for haulage to the surface.

"Change cars here," announced the dust inspector. "This is the end of the first line, 4,034 feet underground. We can leave our overcoats here. There will be plenty of heat down below."

He led the way to a cage on rails which ran into a black hole at an angle of forty-one degrees from horizontal. Again we descended. Going straight down from the surface seems natural enough, but sliding down a steep hill on a section of cellar stairway a mile underground in the dark is in a class by itself. Lights gleamed and new, busy subways opened before us, then vanished as we rushed downward. We stopped after a ride of more than half a mile, with the same impressive cable-stretching motion as before. Here was another busy center, amazingly large considering that it is more than a mile underground. Concrete walls, eight feet thick, indicate that the danger of slides or cave-ins is taken seriously.

We changed cars again, for the third and final stage of our journey. We were nearing the end of the line, and had to ride in the "construction train." Every

level we passed was hotter than the last. At the thirty-seventh, 6,869 feet underground, where the guide stopped to test the air, the ventilation engineer told us he was using ten tons of ice a day to cool the air forced into the mine tunnels.

At the end of one drive (blind-alley tunnel), profusely sweating, naked natives were working a pneumatic drill under the direction of an equally damp white man, stripped to the waist. The din was terrific. The rock the gang was drilling had a temperature of ninety-five degrees. The Village Deep alone has fifty-five miles of underground passageways, while the aggregate of all the shafts and tunnels in the Witwatersrand gold fields would make a subway from New York to San Francisco.

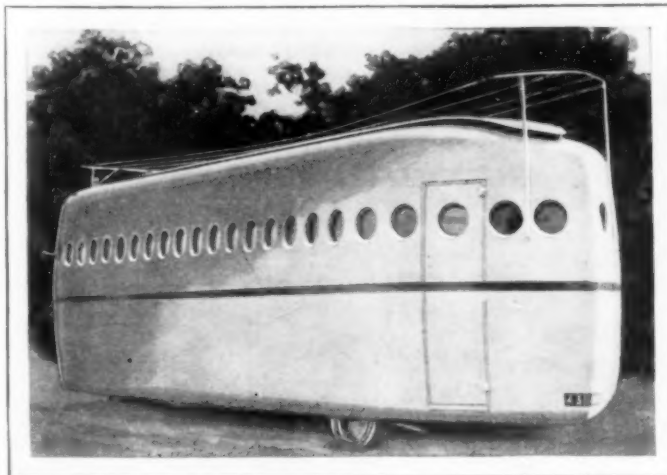
The bottom of the deepest mine in the world is simply the temporary end of the inclined shaft, electrically lighted, twenty feet wide and eight feet high. Sitting there on loose blocks of stone, farther below sea level than the "Lusitania," and looking up at the mile and a half of solid rock between us and the outside of the globe was thrilling, but too hot, and we started for the surface. Half an hour later we were blinking in the sunshine.

Below Johannesburg, the thermometer goes up one degree for every 219 feet down. At 9,000 feet, vertical depth, engineers estimate the temperature will be 105.8 degrees. At the same rate, six miles down the rock is about as warm as boiling water. Some day, when the sun gets old and the outside of the world cools down to 100 below zero, that difference of 150 degrees between surface temperature and temperature six miles down may save the human race.

Conceivably a high type of civilization might go on for centuries within the earth, after the outside was an unbroken glacier, with oceans of liquid air at the poles. But right now the heat is the great obstacle in the way of further downward progress, reducing the efficiency of the workmen and increasing the ice bill until the gold is barely worth what it costs to get it out.

HOME ON WHEELS IS ARMORED FOR FRONTIER TRAVEL

Portholes of bullet-proof glass and armored sides are features of a three-room apartment a Frenchman has had constructed on a motor chassis for his travels. Apparently, he does not intend to confine his roaming to civilized territory, for the big car is fitted for crossing desert regions as well. A parlor, bedroom, smoking room and a folding kitchenette are included in the apartment with portable radio and other modern conveniences.



The Traveling Fort for Frontier Explorations; It Contains a Three-Room Apartment and Has Many Modern Conveniences



Life-Saving Suit That Weighs but Twenty-One Pounds and Has Pockets Inside to Hold Food and Water

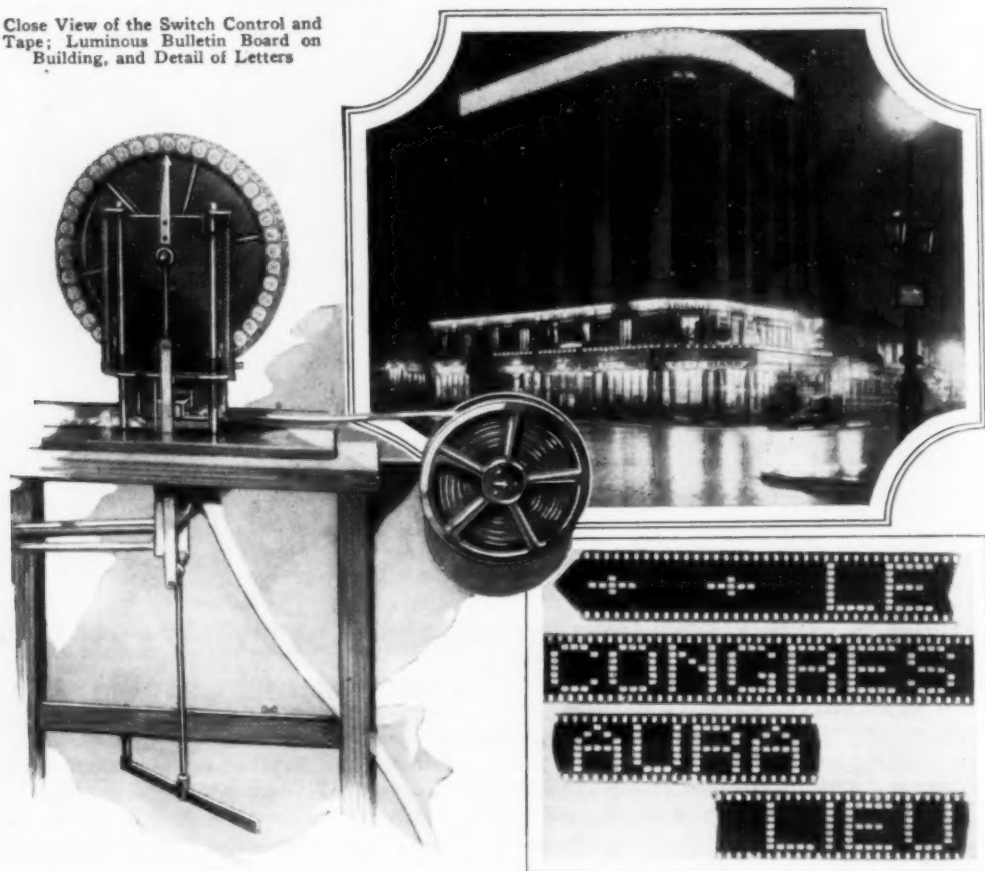
POCKETS IN LIFE-SAVING SUIT HOLD FOOD AND WATER

Persons are kept afloat for hours, it is said, when wearing a life-saving suit a California man has introduced. It can be donned in two minutes, is constructed of three thicknesses of rubber and rubberized silk and has pockets for food and drinking water. The feet are weighted so that the wearer will be able to keep upright and in the headpiece are a number of valves. These automatically close when the person is submerged, but admit air when his head is above the surface. The entire outfit weighs but twenty-one pounds and is insulated with cork to protect the wearer from the effect of changing weather conditions.

More than 800 kinds of trees are known in the United States.

MOVING LETTERS OF FIRE TELL THE LATEST NEWS

Close View of the Switch Control and Tape; Luminous Bulletin Board on Building, and Detail of Letters



News bulletins are written in moving electric letters on signs visible to thousands of promenaders on the Paris streets at one time. The method is similar to that which has been in use for advertising purposes in many large cities, a perforated tape making contacts with electric bulbs that form the proper letters.

The message moves slowly from right to left for easy reading. The events to be chronicled in this fashion are relayed from the newspaper offices, and an operator, sitting in a small cabin near the sign, prepares the perforated tape and places it on a revolving drum. The bulletin board is over fifty feet long and three feet high.

ELECTRIC POP-CORN POPPER OPERATES AT TABLE

It is not necessary to go to the kitchen to pop corn with an electric popper now on the market, for it is quickly connected to any convenient lighting socket and may be used in the living room or at the dining table. The corn is held in a wire basket, which fits upon a base surrounding the heating element. To prevent the kernels



from burning, they are stirred by turning a crank similar to that in a flour sifter. The popping begins in less than three minutes after the current has been turned on, if the corn is in good condition. When the basket is removed, a receptacle for

melting butter may be placed on the heating coils. The popper consumes but little current and, as it may be shut off when not in use, permits further economy. The unit weighs but two pounds and is especially constructed to pop all the corn in the basket.

MYSTERY SUBSTANCE IN SUN FOUND TO BE RARE GAS

What scientists had previously been unable to identify in the sun's corona, has been proved to be argon, by Ira M. Freeman, of the University of Chicago. The substance is a rare gas, constituting about one per cent of the earth's atmosphere and is being used commercially in the manufacture of certain kinds of lights. The discovery is considered remarkable in that the corona of the sun can be observed for only very brief periods during a total eclipse. It has been estimated that during the entire age of science, the total time in which such eclipses have been studied amounts to but one hour.

FOOT POWER REPLACES MOTOR IN TINY PARIS CAR

Run by foot power with the same chain and sprocket arrangement as is provided in a bicycle, a four-wheeled car, like a small automobile, has become popular in Paris. A fair rate of speed can be attained, and the gearing is so adjusted that one man can propel two persons on level ground without extreme effort.



Lined Up for the Start of a Foot-Power Auto Race; Considerable Speed Can Be Attained on Level Ground Even with Two Persons



Suitable for Home or Cannery Use; a Bottle Filler with Control Valve to Eliminate Spilling

BOTTLE FILLER SAVES TIME AND PREVENTS SPILLING

Filling small bottles with liquid is accomplished without spilling and at a great saving in time from a glass supply reservoir through a tube controlled by a valve. Pressing the valve with the thumb permits liquid to run into the bottles, and the tube is closed by releasing the pressure.

MUSKRATS SAVE LIVES OF FISH IN NORTHERN HATCHERY

Muskrats are not generally regarded in the role of life-savers, but their beneficial effects on fish in a government hatchery at Gravel lake, N. Dak., close to the Canadian border, have been so great that the animals are being protected from hunters and trappers and are encouraged to build their houses along the shores of the lake. In doing this, they keep the waters from being completely sealed over with ice, with the result that the fish are not likely to smother. Both fish and muskrats are multiplying there.

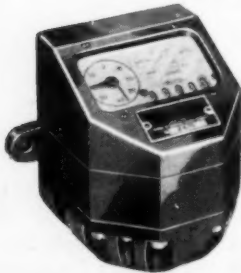


Red-Cedar Stump Shelter House on Auto Highway; It Is Believed to Be at Least 1,250 Years Old, But Is Well Preserved

ROAD RUNS THROUGH-BIG STUMP OVER TEN CENTURIES OLD

One of the sights along the Vancouver highway is a giant red-cedar stump which has been cut through and roofed over so that the road is provided with a natural shelter at that point. It is estimated that the stump is at least 1,250 years old.

GASOLINE METER FOR AUTO HELPS SAVE FUEL



To reduce waste and obtain an accurate check on the fuel consumption of the automobile, a gasoline meter, recently introduced, shows, in gallons and tenths of gallons, how much is being used. The record is indicated in legible figures on a dial, and the instrument is mounted in a bracket on the dashboard. It is connected in the fuel line between the supply and the vacuum tank, and is equipped with a dirt and water trap.

To reduce waste and obtain an accurate check on the fuel consumption of the automobile, a gasoline meter, recently introduced, shows, in gallons and tenths of gallons, how much is being used. The record is indicated in legible figures on a dial, and the instrument is mounted in a bracket on the dashboard. It is connected in the fuel line between the supply and the vacuum tank, and is equipped with a dirt and water trap.

TIME BIRD SPENDS IN NEST TOLD BY ELECTRICITY

With the aid of electrical apparatus, an Ohio man has measured the time a mother wren spends in the nest hatching the eggs, and how much time she takes off. Thirteen minutes is about the average period in the nest without interruption, but the bird is seldom gone more than six minutes at a time during the day. Most of the brooding is done at night and, in the last three days of incubation, the periods of absence are much less frequent. The instrument used to determine the bird's movements is simply a thermo-electrical

unit which registers the temperature of the nest each time the bird goes on or off the eggs. A tiny wire is stretched across the eggs to form a connection with the self-recording instrument.

RUBBER MAT FOR HOUSEWIFE HELPS PREVENT FATIGUE

Hours of standing on hard floors frequently endanger a housewife's health and greatly contribute to her fatigue. This unpleasant feature of home work is said to be eliminated with a mat of sponge rubber on which to stand. It is especially serviceable while ironing or washing on the cement floor of the basement and may also be used for the knees when mopping or scrubbing floors. When not needed, it may be hung on the wall. As an insulator, it also affords extra protection should there be any hazard in using electrical appliances.



Hours of standing on hard floors frequently endanger a housewife's health and greatly contribute to her fatigue. This unpleasant feature of home work is said to be eliminated with a mat of sponge rubber on which to stand. It is especially serviceable while ironing or washing on the cement floor of the basement and may also be used for the knees when mopping or scrubbing floors. When not needed, it may be hung on the wall. As an insulator, it also affords extra protection should there be any hazard in using electrical appliances.

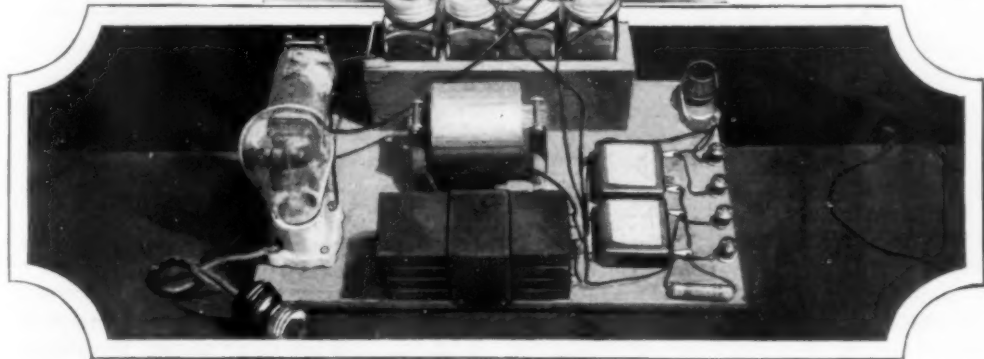
You can build this B-Eliminator for Fifteen Dollars by Arthur B. Kennedy

THE B-battery eliminator described in this article, while low in construction cost, is nevertheless a very efficient plate-power supply, delivering to its output terminals 40 milliamp. of pure direct current at 135 volts. It may be used with any type of receiver with the assurance that there will be no hum to mar the loud-speaker output. The simple construction is apparent in the photo, and this new eliminator has a decided advantage over my first model, which appeared in this magazine a year ago, in that there are no difficult electrolytic condenser cells to form. The electrolytic rectifier cells are easy to form; and the low cost of the unit is due to their simple construction.

The four cells are

shown at the rear in the assembly photos, and are contained in a shallow wooden box, the cells being separated by cardboard inserts. Each cell has two electrodes, one made of aluminum and the other of lead. These are fastened to an

insulated jar cover and immersed in a solution of either common borax, sodium bicarbonate or ammonium phosphate. The author prefers a saturated solution of borax, although a solution made of $\frac{1}{4}$ lb. of ammonium phosphate (monobasic) in 1 qt. of distilled water is generally conceded to be the best electrolyte. In either case absolutely pure distilled water must be used. Cells like those shown in the photo may be obtained on the open market and should be of

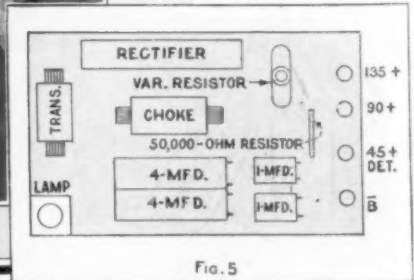
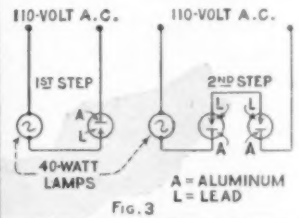
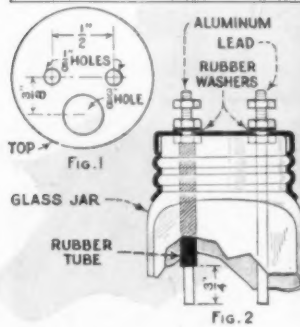
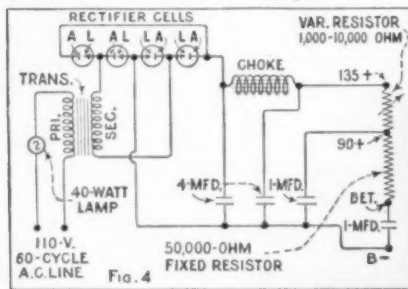


sufficient size to hold 4 fl. oz. of electrolyte. It is an easy matter to make the cells at home; provide four screw-cap pickle bottles of the same size, and, with can opener or bezel cutter, cut a hole, 1 in. in diameter, in each bottle cover. Four disks of hard rubber, thin bakelite, or wood, dipped in paraffin, are cut to the diameter of the bottle necks, and drilled as shown in Fig. 1. Four lengths of 1/8-in. aluminum rod, and the same number of pieces of 1/8-in. hard wire solder are required for the electrodes. Each piece should be 4 in. long, and threaded at one end for 3/4 in., three hexagon brass nuts being provided for each rod. One aluminum and one lead rod are slipped through the insulated disk and fastened in position with a nut above and below the disk, as shown in Fig. 2; the third nut acts as a binding post for connecting the cells. Fahnestock clips can be used instead of the third nuts, if desired.

A tight-fitting rubber tube is slipped over each aluminum rod to within 3/4 in. of its immersed end. The efficiency of the cell depends on this jacket being water-tight, and, while rubber tape can be used,

the electrolyte. Mix the electrolyte in a 1-qt. glass jar; 1 pt. of the solution will be required, and it should be stirred with a glass rod. If borax is used, add a tablespoonful at a time until the water will not take up any more of the salt, let the solution stand a few minutes and then decant the clear solution without disturbing the sediment of undissolved salt at the bottom of the jar. The solution must be kept below 100° F., even after several hours of operation, if the cell is to be a good rectifier. To maintain this low temperature we must have a sufficient amount of solution to radiate the heat that is the product of every rectifier; therefore it is necessary to maintain the 4-oz. solution level in each cell at all times.

With a piece of emery cloth or coarse sandpaper, thoroughly clean the exposed section of each aluminum electrode, this cleaning materially aiding the electrode to form. Up to this point the cells will not act as rectifiers, as they must first be formed; this process puts a rectifier layer on the exposed portion of the electrode. This applies also to commercial cells. The forming is accomplished by passing an electric current through the unformed rectifier jar to decompose the electrolyte, which action in turn attacks the aluminum electrode, building up a coating which has the prop-



the tight-fitting rubber tube is best. The completed cell now looks very much like the standard commercial article shown in the photo on this page, and is ready for

erty of passing the current in one direction only. This layer allows the current



to flow through it from the lead to the aluminum electrode but not in a reverse direction. The forming steps are shown in Fig. 3; for the first step, connect one cell in series with a 40-watt lamp, and permit the 110-volt, 60-cycle alternating house-lighting current to flow through the lamp and cell for five minutes. Repeat this process with each cell, after which they are ready for the second step. Connect two of the cells as shown at the right, Fig. 3, the lead terminals being connected together and one aluminum electrode connected to the 40-watt lamp on one side of the a.c. line, the remaining aluminum electrode being connected to the other side of the line.

Turn on the current; if the lamp lights and goes out immediately, the cells are properly formed; if it does not light at all, they are also properly formed, but if it continues to burn, this signifies that one or both of the cells have not been properly formed. Substitute one of the remaining cells, first in place of one cell then the other; if the lamp still burns, repeat the first step with each of the unformed cells until each pair of rectifier cells extinguishes the lamp instantly. Make sure, in the second step, that the two lead electrodes are connected together and that the current enters and leaves the connected pair of cells through the aluminum electrodes. If the cells refuse to form, the trouble will usually be found in impure water, and the remedy is obvious. To make sure the water used for the electrolyte is thoroughly distilled, a simple

test may be made with a few crystals of nitrate of silver. A sample of the water to be tested is poured into a glass and a few of the crystals added; if the water turns milky, it is unfit for use in the cells.

The wiring diagram is given in Fig. 4, and the instrument layout in Fig. 5. The two 4-mfd. condensers are built up of two 2-mfd. units connected in series and the two 1-mfd. condensers are of the usual heavy-duty type.

While no detailed point-to-point simplified wiring diagram is given here, a large detailed blueprint of this simplified diagram as well as the others, that appear in the article, has been prepared.

The 40-watt lamp in series with the primary of the 160-volt transformer (Fig. 4) is for the purpose of protecting the transformer winding; after the electrolytic rectifier has been left idle for a day or so, it does not begin to rectify immediately, and for a fraction of a second a rather heavy load is therefore placed on the transformer. The lamp limits the current temporarily. The resistors for regulating the output voltages are mounted directly on the baseboard, and the terminals brought

out to standard binding posts or Fahnestock clips, as desired. When not in use, the eliminator must be disconnected from

MATERIAL LIST

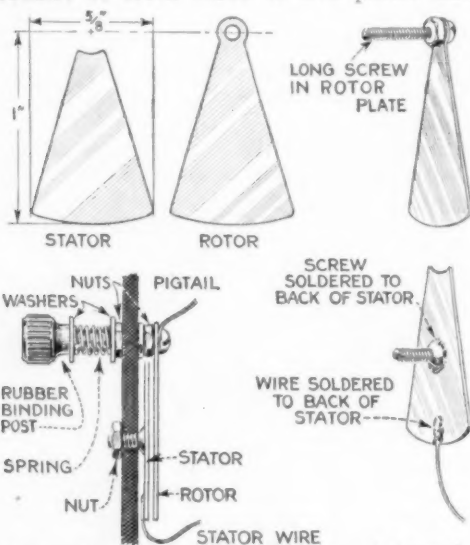
- 1 baseboard, $\frac{1}{2}$ by 8 by $13\frac{1}{2}$ in.
- 1 Jefferson transformer No. 359
- 1 Jefferson choke No. 358
- 4 rectifier cells complete
- 1 1,000 to 10,000-ohm variable resistor, Allen-Bradley, Clarostat, Electrad or similar type
- 1 50,000-ohm fixed resistor, Allen-Bradley, Daven, Electrad or similar type
- 4 2-mfd. filter condensers
- 2 1-mfd. filter condensers
- 1 standard screw socket
- 1 outlet plug
- 1 40-watt lamp
- Screws, wires, etc.

the house current. The transformer and choke specified are cased, not open as in the photo. The long insulated wires on the transformer are the priming leads.

The large detailed blueprint can be obtained from Popular Mechanics radio department, 200 E. Ontario st., Chicago, Ill., for 25 cents to cover cost and mailing. Specify blueprint No. 129.

Midget Condenser Easy to Make

Variable condensers of the midget type play an important part in modern sets; they usually appear in the short-wave sets either as a vernier for the antenna-tuning condenser or as a feedback control in various other circuits. The smaller types consist of from three to five plates and

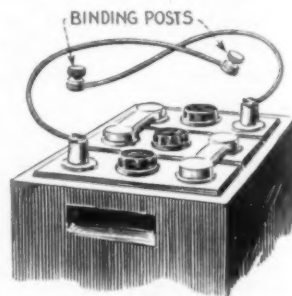


Homemade Midget Variable Condenser of Small Capacity and Details of Its Construction and Assembly

their capacity is often too great for critical adjustment of the antenna circuit in short-wave sets. The writer found the home-made two-plate type shown in the illustration ideal where a very small capacity was required. Cut two plates from No. 20 gauge brass or aluminum sheet to the size and shape shown at upper left. The rotor plate is prepared for mounting with a long brass machine screw, and the plate is held in position by means of a brass nut. Solder a short flat-head screw to the stationary plate in the manner shown, and the unit is ready for mounting. Mount the stationary plate on the panel, lead end down; drill a hole in the panel at such a height that the rotor plate will cover the stator, and place washers or shims behind the nut to separate the rotor and stator plates about $\frac{1}{16}$ in. A spiral spring between two washers is then placed over the screw on the front side of the panel, and a rubber binding-post head provides a knob. When using this condenser as a vernier for the tuning condenser, connect the stator lead to the stator plates and the pigtail lead to the rotor plates.—L. B. Robbins, Harwich, Mass.

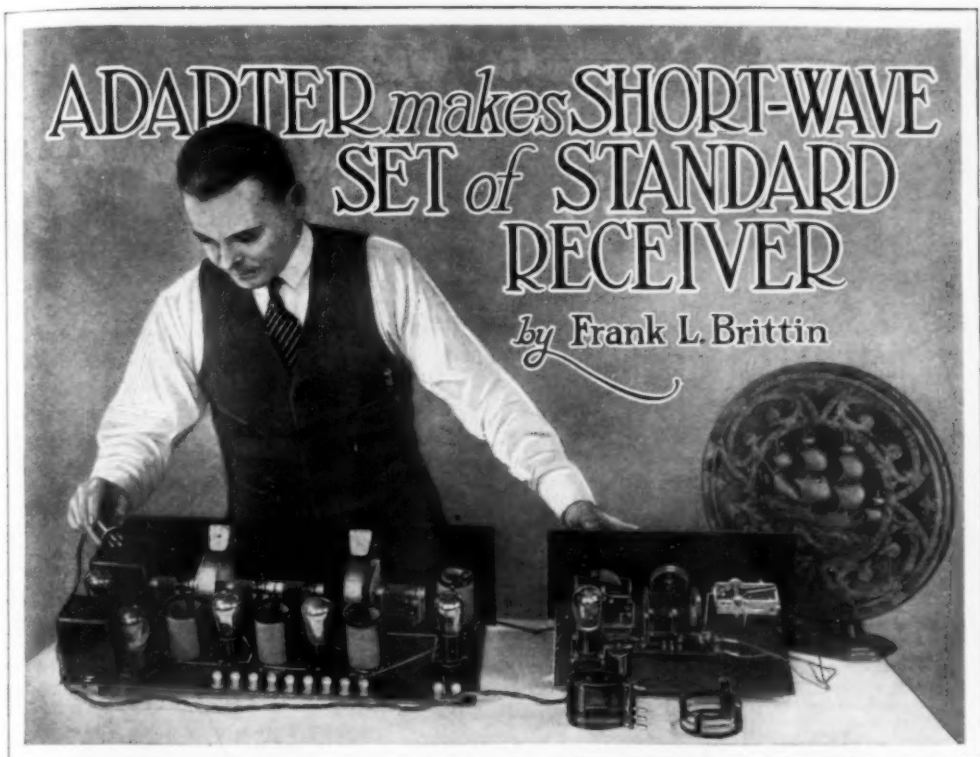
Non-Corrosive Battery Connection

Corroded spring clips at the battery terminals are a common source of poor radio reception. Many radio owners do not realize how fast this corrosion eats into the wire; it often severs the connection completely. Short lead-wire leads from the battery posts avoid this trouble and are easy to fasten. Short lengths of solid-wire solder, as shown in the sketch, may be used for the purpose, if desired. Slots are sawed in the battery posts, the lead wire inserted and clinched in position by a few light taps with a hammer. Small rubber tubing may be slipped over the lead wires and Fahnestock clip terminals also soldered or clamped at the ends; or binding posts may be used, if desired.



ADAPTER *makes* SHORT-WAVE SET of STANDARD RECEIVER

by Frank L. Brittin



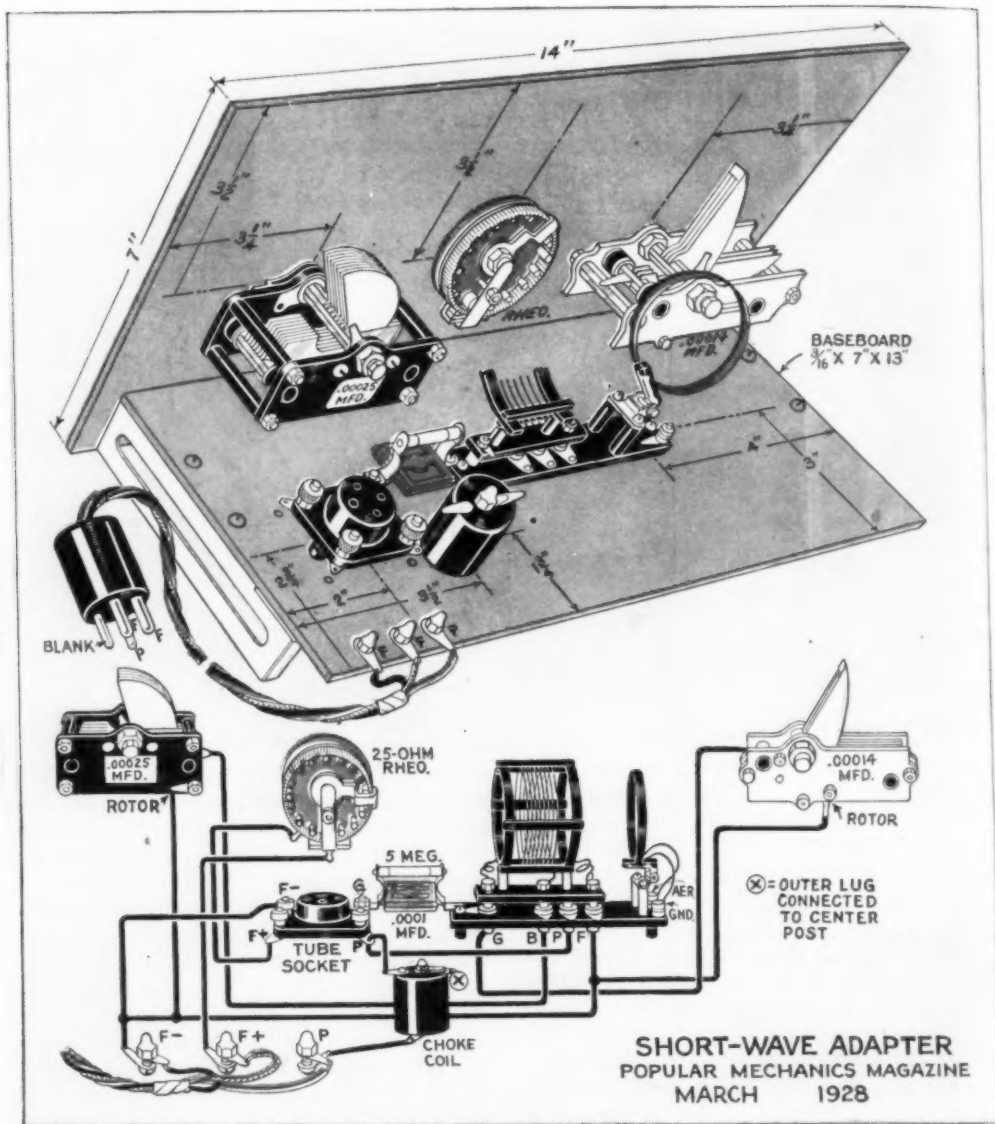
OWNERS of standard broadcast receivers can very easily convert them into the short-wave type with the simple adapter unit described in this article.

This adapter, like any short-wave receiver, is not at all complicated, since it is, in fact, nothing but our old friend the three-circuit tuner. The adapter, fitted with suitable short-wave coils of the plug-in type, is shown in detail on page 478. In use the detector tube is transferred from the receiver to the adapter unit, the filament and plate connections being made by means of an old tube base, plugged into the detector socket in the original set. The adapter unit may be disconnected very quickly, restoring the set to its use as a standard broadcast receiver, as there are no battery connections other than the filament connection provided for in the adapter plug. The complete cost is \$32.41, including the set of short-wave coils and coil-mounting unit.

Short-wave reception is highly satisfactory in localities where static is a year-round trouble maker on standard wavelengths, and in crowded districts the pro-

grams from the large broadcasting stations may often be picked up on the short waves when it is impossible to get them on the standard wavelengths. There are several large stations now broadcasting simultaneously on both the low and high bands, and the short-wave adapter thus becomes a medium through which real selectivity may be attained. For distant reception there is nothing so satisfactory as short-wave broadcasts; we have received several letters from South America, Australia and South Africa reporting reception of American stations on the short waves, and similar reports on foreign-station reception in this country. Loud-speaker amplification is obtained with the same quality as in the original set, as the same audio-amplifier stages are used in both cases.

The layout is very simple, as shown in the upper sketch on page 478, where each instrument is shown in its proper position, ready for wiring. The adapter plug is shown connected to the rear of the sub-panel with three colored leads. The plug is made from the base of an old X-type



Above, Front and Subpanel Layouts, Showing Instruments in Position; Below, Simplified Wiring Diagram, Showing Original Instrument Layout with Point to Point Connections

tube, the old tube being easily removed from the base by carefully heating the latter over a flame. The internal leads in the base will be found soldered to the prongs; clip these leads, leaving them as long as possible so that the three colored leads can be soldered to them. Looking down into the shell, as shown below the schematic diagram on page 479, the proper prong connections are easily located. Hold the base so that the little pin on the side is up, and you will note that the plate

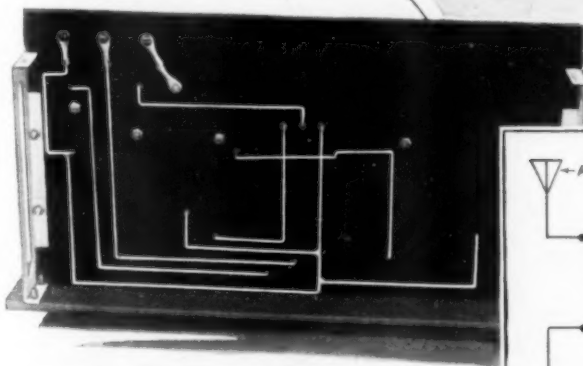
prong is at the upper right, the grid prong at the upper left is left blank, and the two filament connections are made to the two large prongs below. Sealing wax is then poured in to seal the shell. The colored rubber-covered flexible leads should be 4 ft. long so as to facilitate making quick connections, and the adapter unit may be used either at the side or on top of the usual cabinet or console.

The simplified wiring diagram given below the layout on this page requires little

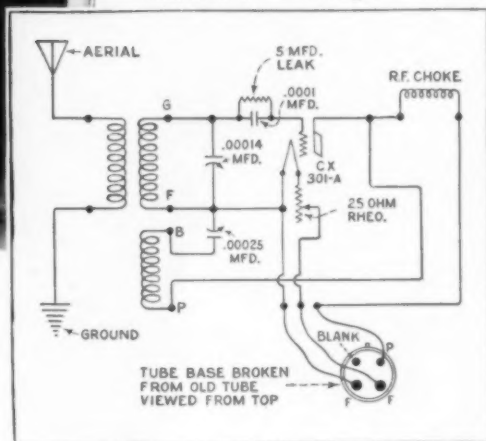
comment; note, at the point marked X at the choke coil, that three terminals appear at the top, two of which are connected. To make this connection, remove the nut on the center post and place a soldering lug under it, this lug being then soldered to the outer lug at the right; the circuit connections are then made to the remaining lug at the top and the lug at the base of the choke. The machine screw on the base of the choke goes down through the subpanel and the connection is made to a soldering lug under this panel. Be sure the rotor plates of the variable condensers are connected just as shown. The mounting base for the plug-in coils is held in position on the sub-panel by means of two machine screws; note the position of the aerial and ground posts at the right of the coil unit. The aerial and ground leads are removed from the original receiver and connected at these points. To save time, it is more convenient to run a set of separate leads from the main set aerial and ground posts to the adapter and leave them permanently connected. The plug-in coils in the set specified have a range of 15 to 130 meters and are completely interchangeable. The coils are

broadcast bands. The rear-view photos on pages 479 and 480 show the completed unit ready for use; the under-subpanel view on this page shows the subpanel brackets and simple method of wiring. No spaghetti tubing is required, but care should be taken that the wires do not touch at points where they cross. Solder every connection carefully, and make each lead as short as possible.

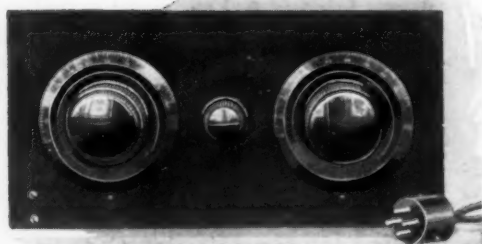
The tuning is very simple. Connect the adapter plug to the standard set, transferring the detector tube to the adapter unit, and connect the aerial and ground to the base of the coil mounting. Turn on the filament switch of the receiving set



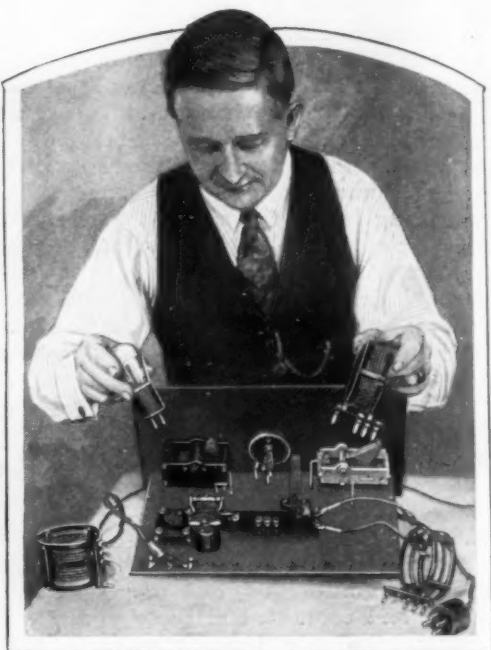
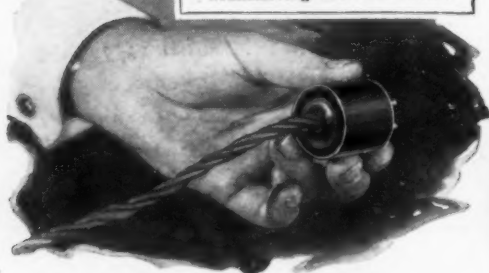
Left, Under-Subpanel View of Completed Unit; Upper Right, Rear View from Above; Below, Schematic Diagram and Sketch of Transfer Plug Connections



the same as those used by the MacMillan and the University of Michigan Greenland expeditions. The mounting base is included with the set of coils. The dials should be of the vernier type for best results, as tuning on the short waves is slightly more critical than on the standard



Above, Front Panel; Below, Completed Socket Plug; Right, Plugging in Coil and Transferring Detector Tube



and adjust the detector-tube rheostat of the adapter unit to the point where a slight hissing noise is heard in the speaker. Rotate the vernier dials on the unit until a station is located; volume is then controlled by whatever device is employed on the standard set for adjusting the amplifier output to the speaker. For this particular unit, builders are advised to

with an adapter built up of these parts, and, although other equally good parts may work just as well, unexpected difficulties often arise when substitutions are made. Since short-wave receivers are necessarily designed for low loss, long leads must be avoided, and nothing but high-grade parts should be used.

A large blueprint of the layout and wiring diagrams has been prepared and may be obtained from Popular Mechanics radio department, 200 E. Ontario st., Chicago, for 25 cents to cover cost and mailing. Specify blueprint No. 130.

MATERIAL LIST

- 1 front panel, $\frac{1}{2}$ by 7 by 14 in.
- 1 subpanel, 3-16 by 7 by 13 in.
- 1 set Aero coils, type LWT-125, complete.
- 1 Amsco variable condenser, .00014 mid.
- 1 Amsco variable condenser, .00025 mid., type 514.
- 1 Aero 60-choke.
- 1 Carter fixed condenser, .0001 mid., with clips.
- 1 Tohe gridleak, 5-meg.
- 1 X-type spring-suspended socket.
- 1 rheostat, 25-ohm, Yaxley, Frost or similar type.
- 2 vernier dials, any good standard make.
- 1 pair Aero, subpanel brackets.
- 1 tube base (may be broken from an old X-type tube).
- 9 6-32 nickelplated brass machine screws, round-head, $\frac{1}{2}$ in. long.
- 4 6-32 brass machine screws, round-head, 1 in. long.
- 3 lengths No. 14 round, tinned-copper busbar wire.
- 15 soldering lugs, long round-hole type.

use the parts specified in the material list. The laboratory tests, of course, were made

Safety Battery Clips

To prevent fire hazard when A-battery leads are short-circuited, a safety clip of the type shown in the drawing has been placed on the market. It consists of a battery clip of the conventional design, to which a fuse-carrying holder is attached, the holder being made to accommodate standard automobile fuses, which can be obtained at any garage or auto-supply shop.



Grounded Rotors Eliminate Body Capacity

When buying the parts for a receiver, select variable condensers of the ground-rotor type. This improved type is easily distinguished from the old type by its peculiar construction, the stator plates being insulated from the metal frame and supported by strips of hard-rubber or other good insulating material. The rotor is not insulated, but is grounded to the metal frame or end plates. When the instruments are wired in the circuit it is a simple matter to keep all the rotors at ground potential, resulting in the elimination of troublesome body-capacity effects.

Lighting Fixture Is Also Speaker

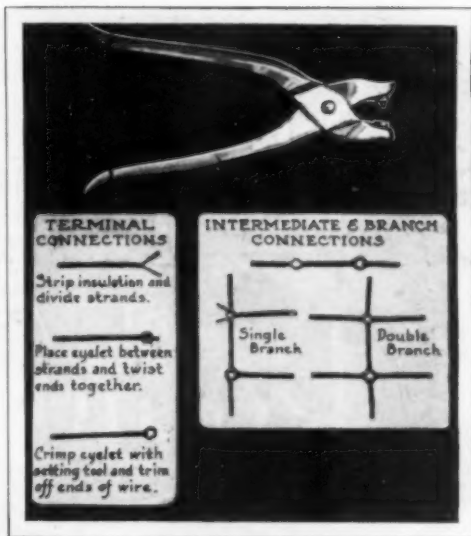
A unique combination of radio loud speaker and lighting fixture is shown in the photo; available in several types, it is so designed that any speaker unit may be employed. The combination makes use of two cones, one half the size of the other, each taking a certain proportion of the high and low notes. Both cone diaphragms are suspended on the same pin. The speaker leads are drawn through the lighting fixture, and the latter is securely



anchored so that no vibration is transferred to the speaker. The speaker leads are brought out at the wall plate in the usual manner. Wall plates are now available in a number of different designs,

some providing for aerial and ground connections for the set as well as loud-speaker outlets. The fixtures are made in accordance with prevailing styles for apartment-house and hotel equipment.

☐ 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.



Above, Setting Tool; Below Are Shown Various Steps in Making the Connections

Wiring Set without Solder

At the two recent radio shows, a novel method of wiring a radio set without solder was demonstrated in an efficient and simple manner. The story is practically told in the drawing, and needs little comment; it has some decided advantages for the home-set builder, and the terminal kit is available for less than a good soldering outfit would cost.

Transformers Plug into Standard Sockets

Shielded intermediate-frequency transformers and oscillator coils of the plug-in type are now appearing on the market, the types shown in the photo being designed to plug into standard X-type tube sockets. These transformers are put up in matched sets of four, which have been sealed in their aluminum cases. A fifth connection is provided on the case for grounding. Advantages claimed except the plug-in feature, are complete shielding and accuracy in matching.



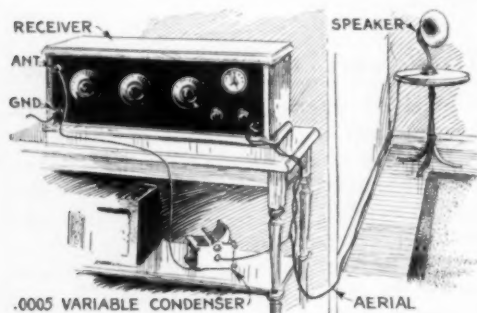


Helpful Hints from Radio Experts

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

Using Loud-Speaker Leads as Aerial

Very often loud speakers are utilized in a room 20 or 30 ft. distant from the set,



Left, Variable Condenser Showing Connections; Right, Loud Speaker Located in Adjoining Room

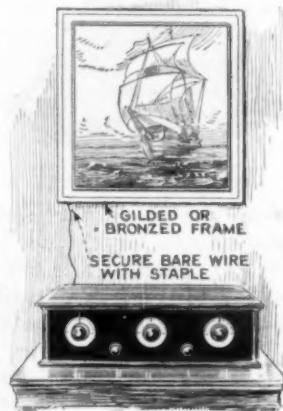
and in this case it is quite possible to employ the loud-speaker connecting wire as an aerial. To do this a .0005-mfd. variable condenser is used in the manner shown in the sketch. It is connected between the black lead of the loud speaker and the aerial binding post on the set. To be really efficient, the leads to the loud speaker should be at least 25 ft. long and

2 or 3 in. apart.—Bert E. Smith, engineer, Allen D. Cardwell Mfg. Corp., Brooklyn.

Picture-Frame Antenna

The picture-frame antenna shown in the sketch not only makes a good aerial, but solves the problem for tenants in apartment buildings. Anyone who has a fairly large picture in a gilded or bronzed frame has a ready-made aerial for instant use;

clean a spot on the frame at a point that will not show from the front, and fasten the bared end of a short wire, from the aerial post on the set, to the frame with a small staple.—E. F. Reinhart, engineer, Permway Mfg. Co., St. Charles, Mo.



Bringing Old Audio Amplifier Up to Date

As many of the most important improvements recently made on receiving apparatus are in the audio end of the set, this article is for the benefit of the man who has a receiver that was first-class two years ago but now is considered "tinny" or high-pitched. The expense of the alteration is very small as the only additional apparatus necessary is a choke of 30 henrys or more (this choke may be made from the secondary of an old a.f. transformer), two .1-mfd. coupling condensers, two gridleaks and a 2-mfd. condenser. Disconnect the audio transformers, and connect the outside ends of the primaries to the inside ends of the secondaries. Usually these ends are marked P and F; if the coils cannot be seen, try the P and F connections, and, if the signals are weak, make the connections from B to F. The plate of the tube is connected to the two connected ends of the transformer windings and the other end of the primary to the coupling condenser, the other end of the secondary being connected to the positive B-post. This positive B-post will be the detector B, for the first stage, and the

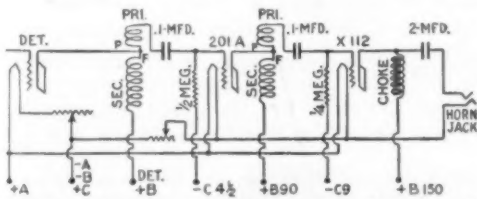


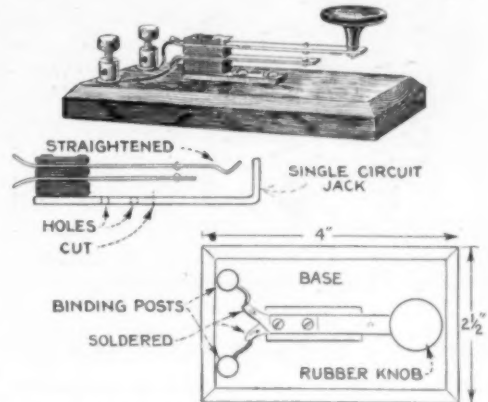
Diagram Showing Completed Audio Changes and Speaker Filter

90-volt B on the second stage. The 30-henry choke coil is connected from the plate of the power tube to the amplifier B-post; this voltage should be 135 to 150 for best results. Note that the 2-mfd. condenser is placed in series with the plate of the power tube and the speaker, to keep the high-voltage d.c. supply out of the speaker windings. With the amplifier wired as shown in the diagram, the volume will be slightly less than that obtained before, but the tone will be greatly improved, bringing in the low notes formerly unheard. If more volume is desired, an additional stage may be used between the detector and first audio, with the grid return to the 4½-volt C-connection. The

gridleaks are installed on single mounts at convenient points and connected as shown in the diagram.—Chas. Middleton, chief engineer, Station WRAF, LaPorte, Indiana.

Experimenters' Telegraph Key

A simple and effective telegraph key may be constructed from an old single-

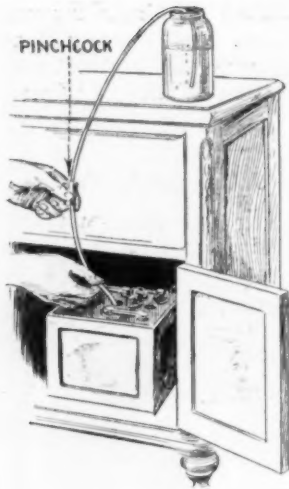


Above, Sketch Showing Completed Key; Below, Construction Details and Top View of Assembly

circuit jack. The base is cut in half, as shown in the sketch, and two small holes are drilled in one of the halves for screws. The upper blade of the jack is straightened out, or can be cut off if desired. A hole is drilled in the upper blade and a telegraph-key knob, or any small rubber knob, fastened at the end of the blade. The base may be of wood, sandpapered and stained if desired; this base is 4 by 2½ by ½ in., two holes being drilled at one end and binding posts inserted. Two wires are then soldered to the ends of the jack blades and connected to the binding posts; these wires may be run underneath the base or on top. The key is now ready for use; the blades are spread apart with the fingers until the correct distance between the silver contacts is obtained.—Herman R. Wallin, radio operator, S. S. "Cornelia," Brooklyn.

Adding Distilled Water to Battery

The storage battery is often placed in a very unhandy position when it is necessary to add distilled water and the usual battery-filling devices do not offer a solution to the problem. I use a quart jar,



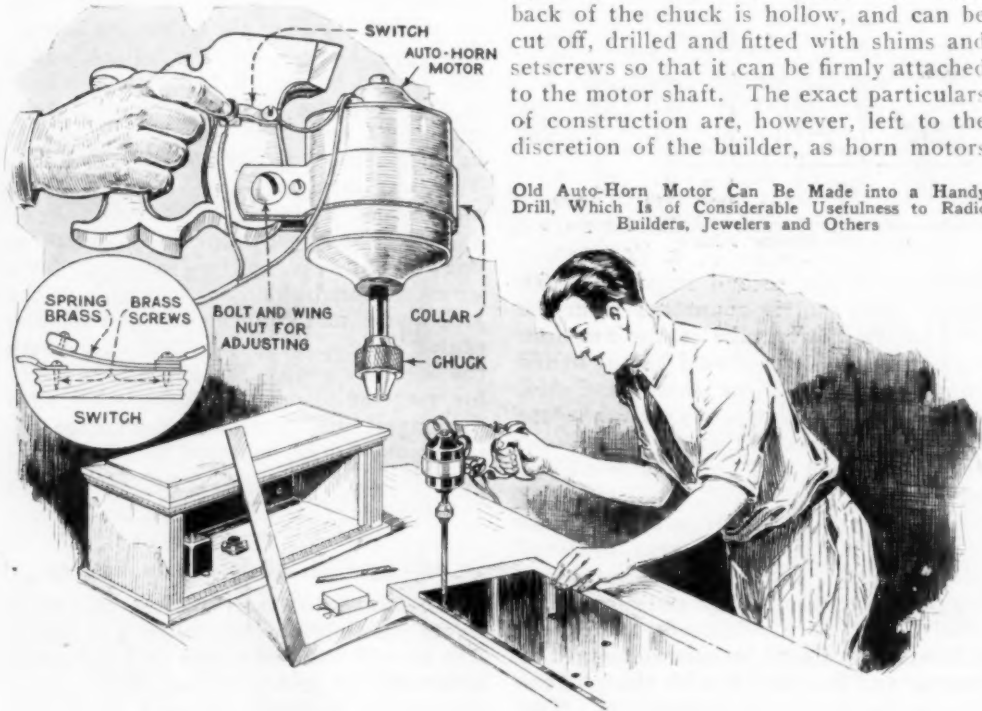
placing it higher than the battery, and regulate the flow of water through a small rubber hose by means of a pinchcock. The water is siphoned into each cell without spilling, and the hose is handy for use in the garage as well as for the radio battery.—C. R. Yarger, chief engineer, Station KFNF, Shenandoah, Iowa.

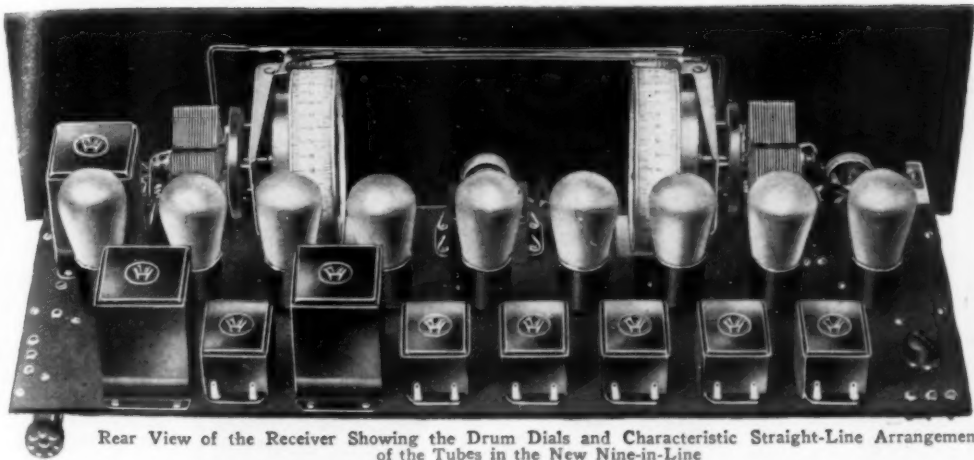
Radio Drill Made from Auto-Horn Motor

The small electric hand drill shown in the accompanying drawing will be found handy for the radio builder, jeweler or any artisan working in localities not sup-

plied with house-lighting current. This drill operates from a 6 to 8-volt battery. The motor is one obtained from a motor-driven auto horn. It is usually thoroughly shielded by a steel cylinder, and the wire leads come out through holes in the face covering the commutator end of the motor. First make a steel collar that will encircle the motor and can be clamped solidly around it, as shown. Spread the ends of the strap below this bolt to fit over the end of a saw handle. Enlarge one of the bolt holes from the bottom end of the handle; drill similar holes through the ends of the collar, and then fasten it to the handle, in the location indicated, by means of a machine screw and wing-nut. The motor can be swung and clamped at different angles from the handle. Make a switch on the handle that will come under the thumb, by screwing a short piece of spring brass to the wood, with a small knob on the free end. Arrange a second screw under the free end of the spring, as shown in the detail. Enough of the shaft will project from the plain face of the motor to allow the attachment of a small chuck taken from a hand drill. In most cases the shaft back of the chuck is hollow, and can be cut off, drilled and fitted with shims and setscrews so that it can be firmly attached to the motor shaft. The exact particulars of construction are, however, left to the discretion of the builder, as horn motors

Old Auto-Horn Motor Can Be Made into a Handy Drill, Which Is of Considerable Usefulness to Radio Builders, Jewelers and Others



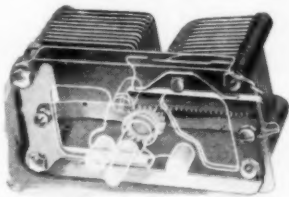


Rear View of the Receiver Showing the Drum Dials and Characteristic Straight-Line Arrangement of the Tubes in the New Nine-in-Line

are not all alike. Extend one of the motor leads to the battery and solder the other to the screw holding the switch. Extend another lead from the screw under the switch to the other battery terminal. By using long flexible leads, the drill can be carried anywhere along the bench or shop. Adjust the angle of the drill as desired, and, holding the handle in a natural position, press down on the switch. The motor will then operate the drill until the switch is released.

Condenser Plates Slide into Engagement

Differing from the usual type of variable condenser, the sliding condenser shown in the photo is said to have many features of advantage. It has a self-



cleaning, nickel-silver contact spring, insuring minimum resistance. The main bearing is relieved of all strain, as it is constructed on the same principle as the "floating" automobile axle. The small pinion and shaft are in one piece, and the pinion has helical teeth, engaging with the rack, which insures smooth operation. The slides on which the movable plates are mounted run in accurately milled, parallel grooves. To prevent backlash, a phosphor-bronze spring is used. This keeps the rack in mesh with the pinion and compensates for wear.

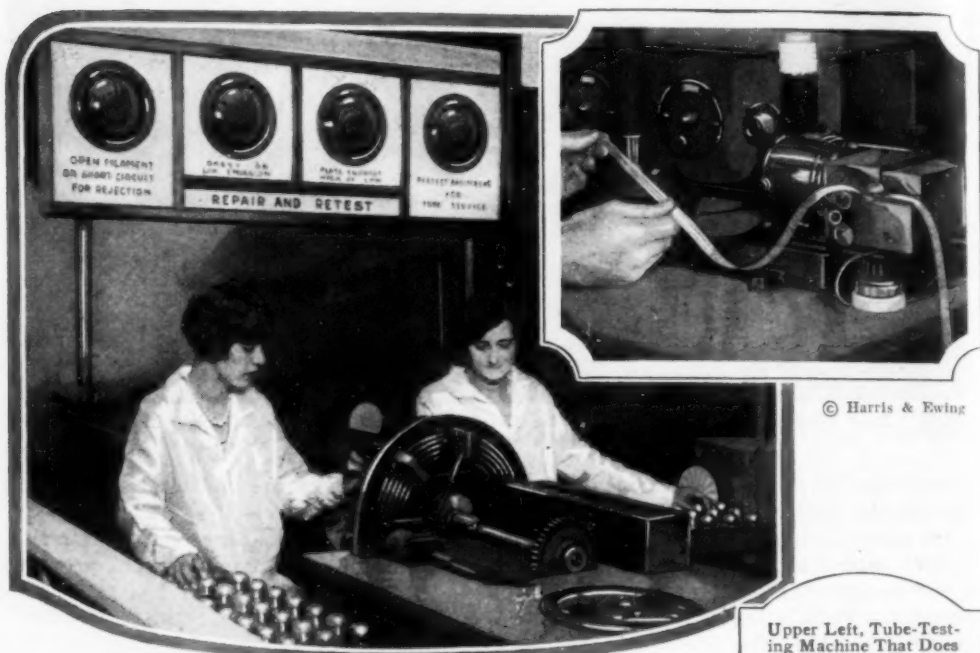
Drum Dials Feature of New Nine-in-Line

The new Nine-in-Line receiver for 1928 has several advantages over previous models; the manufacturer has made several changes in the intermediate transformers, and also greatly improved the a.f. end of the receiver. The addition of an output transformer to keep the high plate current, necessary for the operation of power tubes, from the loud-speaker windings, is a further improvement. New drum dials are an attractive feature of the set, and the low vernier ratio and illuminated scale make close tuning very simple. The rear-view photo of the set shows the arrangement of the drum dials and various other instruments, and the characteristic straight-line arrangement of the tubes. The circuit employed is the usual super-type with several original variations; the wiring diagrams and construction details are supplied by the maker of the parts.

Gas Pipe a Poor Ground

The gas pipe is not only a poor ground but a dangerous connection for any electrical wiring. Lightning in the vicinity of the aerial often induces heavy charges in the aerial and ground system, and sparks sometimes result. Hence, leaking joints in the gas pipe may result in a serious blaze. From the standpoint of a ground for the set it is inefficient, due to the lead-filled joints, which cause a high resistance.—August Jeffers, Philadelphia, Pennsylvania.

Facts and Fads for Radio Fans



© Harris & Ewing

Upper Left, Tube-Testing Machine That Does the Work of 150 Girls, Automatic Test Indicator Overhead Registering Faulty Tubes Which the Operators Then Discard; Previously Tubes Were Tested One at a Time, a Different Machine Being Required for Each Fault; Right, Radio Equipment Recently Installed in Washington for Broadcasting Weather Forecasts to Aviators



Above, R. L. Mack, Former Naval Radio Operator, Directing a Driverless Car by Means of Radio Control; the Inventor Claims the Control Mechanism Is Adaptable to Any Car; Insert, Close-Up of Steering-Column Mechanism in a Second Car, Actuated by Remote Control; at Right, Comparing the New 100-Kilowatt Transmitting Tube with One of the Old Types; These Tubes Were Exhibited at the New York Radio Show

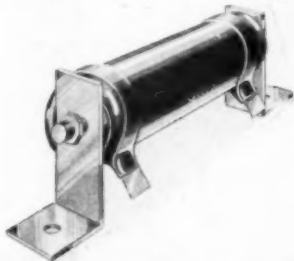


Filling Storage B-Batteries

When adding water to storage B-batteries with a small hydrometer, it is difficult to see when the liquid is high enough in the cell because of the small opening. To save time, add water until it is level with the top of the filler opening, where it can easily be seen, then draw out enough to lower it to the proper level. The withdrawn water is placed in the next cell, and so on for each cell. Since the water is taken out at once and from the top of the cell, it will not be mixed with the electrolyte to any great extent. To equalize any slight amount of the electrolyte that may be carried over, commence at the other end of the battery when water is added the next time.—E. T. Gunderson, Jr., Humboldt, Iowa.

Mounting Prevents Resistor Sag

A new line of wire-wound resistors, designed for heavy-duty use in correct voltage regulation for homemade A, B and C-eliminators, is now available. These units are provided with mounting rods and supporting brackets, which prevent sagging of the resistors under heat, and also permit rigid, easy assembly. Designed for use in power packs delivering up to 500 volts,



the values range from 500 to 25,000 ohms, with heat dissipation claimed to be in excess of 15 watts. Ruggedly constructed, these

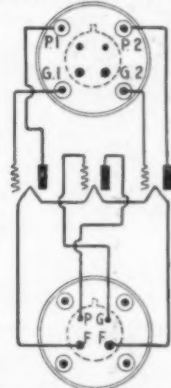
voltage regulators pass, according to their size, from 27 to 150 milliamp., which is ample for all standard units employing the 171 or 210 power tubes.

One Tube Does Work of Three

Practically three tubes in one, this addition to the tube field enables the use of a loud speaker with a receiver employing only one tube. Drawing a filament current of only .25 amp. maximum, it may be operated from dry-cell batteries, making it ideal for portable sets. As the fila-



BINDING POST CONNECTIONS



BOTTOM PIN CONNECTIONS

Left, Three-in-One Tube Showing Simple Arrangement of Binding Posts; Right, Diagram of Connections

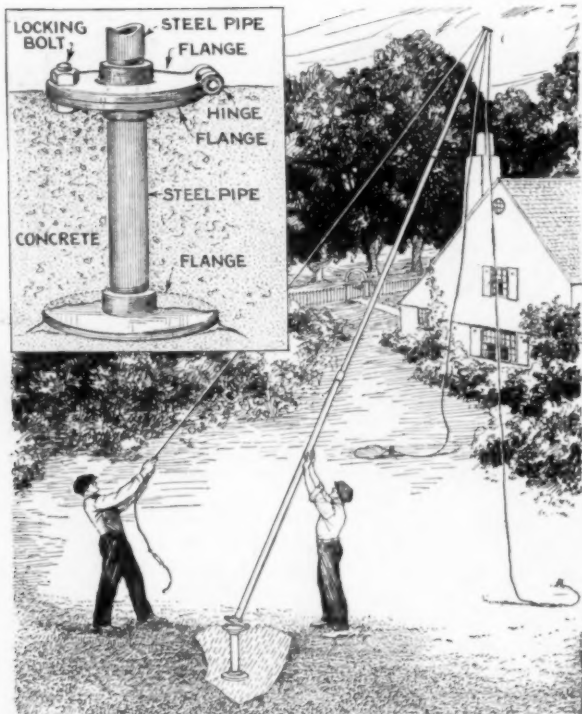
ment is larger and more rugged than the 199-type of dry-cell tube, it will stand rougher handling and has a much longer life, according to the claim of the manufacturer. The tube has a thoriated filament, and may be reactivated in the usual manner, should it become paralyzed through accidental application of excess voltage. It may also be used on the same rheostat in parallel with any five-volt tube and it fits in any of the standard sockets, so is suitable for any circuit. The diagram shows the usual connections at the tube base and the additional binding-post connections above. Used in a set incorporating one stage of r.f. amplification, detector and two stages of a.f. amplification, the first stage of audio being reflexed on the r.f. stage, the set is capable of giving good distance reception and loud-speaker volume.

Condenser Mounts on Socket

Neutralizing condensers are usually mounted on the subpanel or are held in place with rigid busbar wire, but the type shown in the drawing is designed to be fastened directly on the



grid terminal of the socket, which eliminates two soldered connections. It is easily adjusted by means of a small screw and requires less space than most similar instruments.



Insert, Base Section Showing Hinged Flanges and Locking Nut; Below, Method of Raising the Mast

Steel Radio Mast Easily Erected

An English manufacturer has recently introduced a strong and neat radio mast that can be erected by any novice. It is made in two sections, the lower part to be imbedded in concrete as shown. The mast proper is hinged to the lower section, and assembled on the ground before erection. For convenience in transport, the mast is built up from three steel tubes, in two 12-ft. sections and a 6-ft. top section. The guy wires are fastened while the mast is still on the ground, and are employed as shown to pull the mast into a vertical position, an easy task due to

the hinged baseplate. The guy wires are then fastened to three steel angles driven into the ground to serve as anchors.

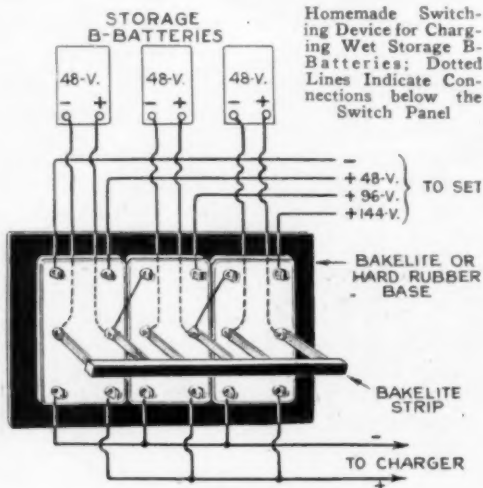
Installing Speaker Jacks on Subpanel

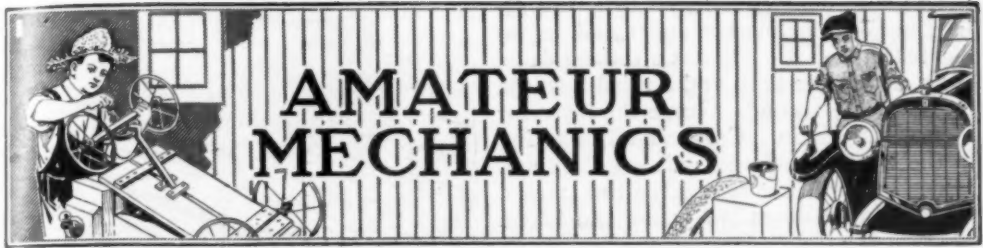
Very few of the modern sets now show speaker jacks on the front panel, the tendency being to do away with a multiplicity of phone and speaker jacks with their complicated wiring. As the speaker plug is seldom withdrawn from the set, the use of two miniature jacks of the cord-tip type, mounted at a convenient point at the rear of the subpanel, answer the same purpose and are hidden from view.

Charging Switch for Wet B-Batteries

An inexpensive switching device for charging wet B-batteries is shown in the accompanying sketch. As it is necessary to charge such batteries in parallel, the normal method of changing connections is far too slow, and short circuits are likely to occur. The three small porcelain-base d.p. d.t. knife switches may be obtained for ten cents each. The fiber strip joining the blades of each switch is removed, and replaced with a narrow bakelite strip, long enough

to join the blades of all three switches. The switches are then mounted on a piece of hard rubber or bakelite, and batteries and charger connected as shown in the diagram. When the switch is thrown in one direction, the batteries are connected in parallel for charging, and when thrown in the opposite direction they are in series for the receiver.





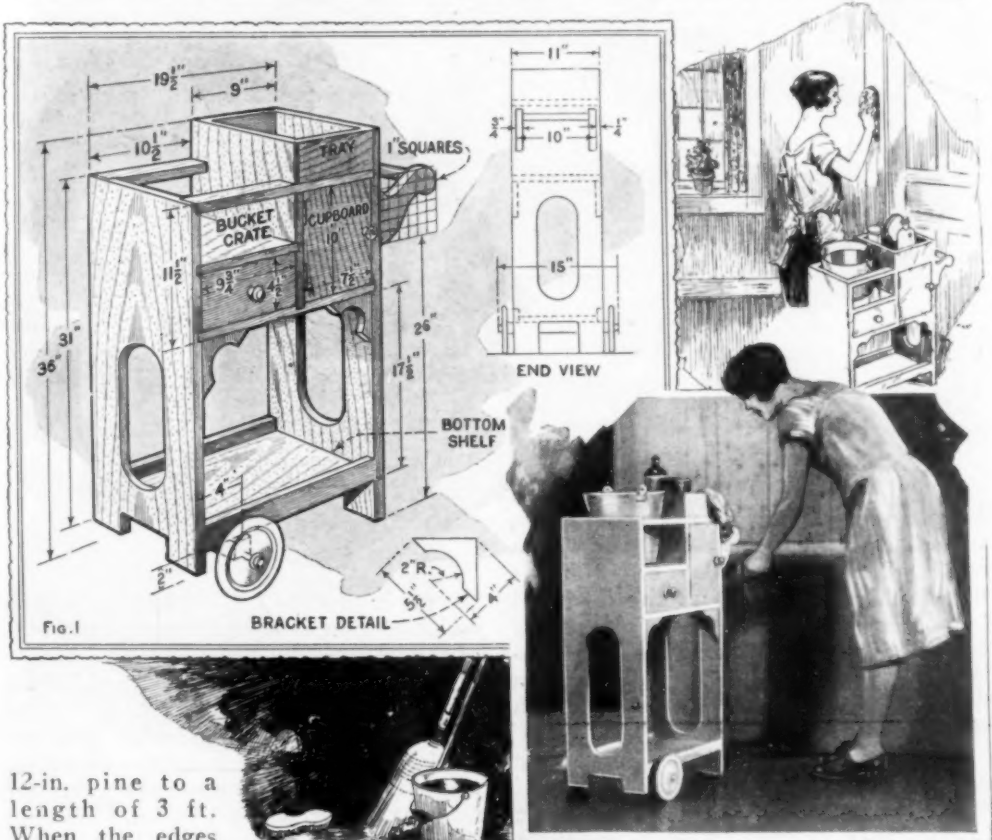
Utility Cart for Housewives

By EDWIN M. LOVE

THE utility cart shown in the illustration is a portable cupboard for soaps, cleaning fluids, and necessary cloths, being equipped with a rack for an 8-qt. water bucket and a tray in which the cans and boxes are neatly arranged.

For the long side, cut a piece of 1 by

width will be about 11 in. If the other parts correspond in width, there is no need of being accurate to any set figure. The form of this end is well shown in Figs. 1 and 2. Mark one edge as the face edge, from which to work, and square two fine pencil lines or knife cuts full width across



12-in. pine to a length of 3 ft. When the edges are jointed straight and square, the

the unsanded inner face, locating the 3/4-in. dado 3 in. below the upper end, as indicated in Fig. 2. Lay out a second dado, 10 in. below the first, and a third 1 ft. 4 3/4 in. below the second. Gauge the three for a depth of 5/16 in. Crosscut all, working in the waste wood and splitting the lines. If the saw will not follow the line, tack a wooden strip down to guide the blade.

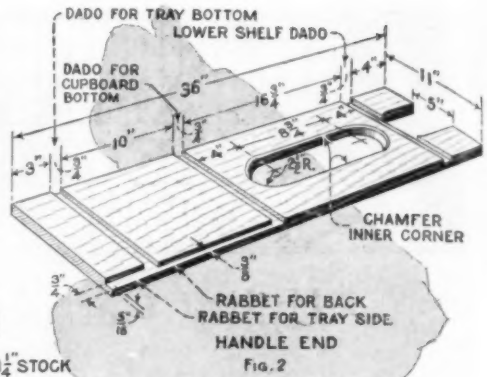


Fig. 2

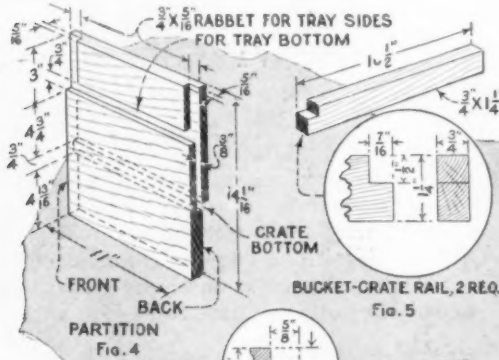


Fig. 4

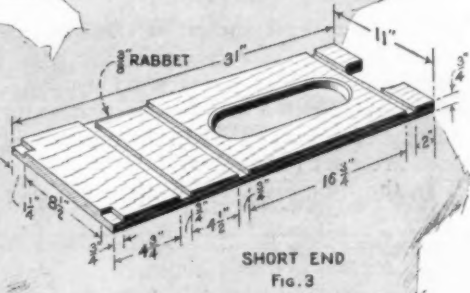
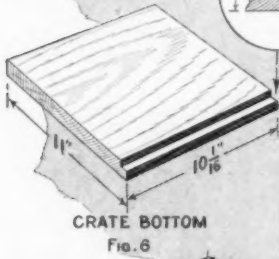
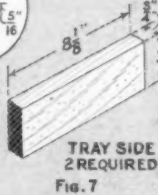


Fig. 3

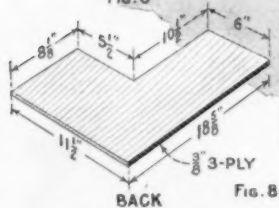
BUCKET-CRATE RAIL, 2 REQ. Fig. 5



CRATE BOTTOM Fig. 6



TRAY SIDE 2 REQUIRED Fig. 7



BACK Fig. 8



Roughly knock out the waste and trim smooth with a chisel, held flat, or with a router, if one is available. Fig. 3 details the short endpiece. With the long end for a pattern, as in one of the photos, lay out its finished length, as well as the position of the middle and lower dados. In this way inaccuracies will be reduced to a minimum.

The upper dado is 4 1/2 in. above the middle one. Note that in the back edge of each endpiece a rabbet, 3/8 in. wide and cut to the depth of the dados, is made to house the ends of the three-ply back. Gauge and chisel out the rabbets between

the upper grooves. Likewise, in the long end, cut 3/4-in. rabbets to receive the ends of the tray.

The ornamental holes have semicircular ends of 2 1/2-in. radius, centering on the stock 4 in. from the dados. The feet are laid out by continuing the side lines of the holes, and the rounded corners are made by boring, with a 1-in. bit, from both sides, to avoid splintering. It is immaterial whether they are cut to the bottom of the shelf dado, as in the drawing, or

$\frac{1}{2}$ in. below. Cut the top, as well as the curved ends of the holes, with a keyhole saw, and since this tool is likely to splinter the inner face, it may be necessary to make the $\frac{1}{4}$ -in. chamfer indicated in the drawing. Smooth the hole ends with a wood rasp moved in an oblique, rotating motion, as shown in the photo, and lift it on the return stroke. Recesses in the upper corners of the short end, made $\frac{3}{4}$ by $1\frac{1}{4}$ in. and $\frac{5}{16}$ in. deep, carry the bucket-crate rail ends.

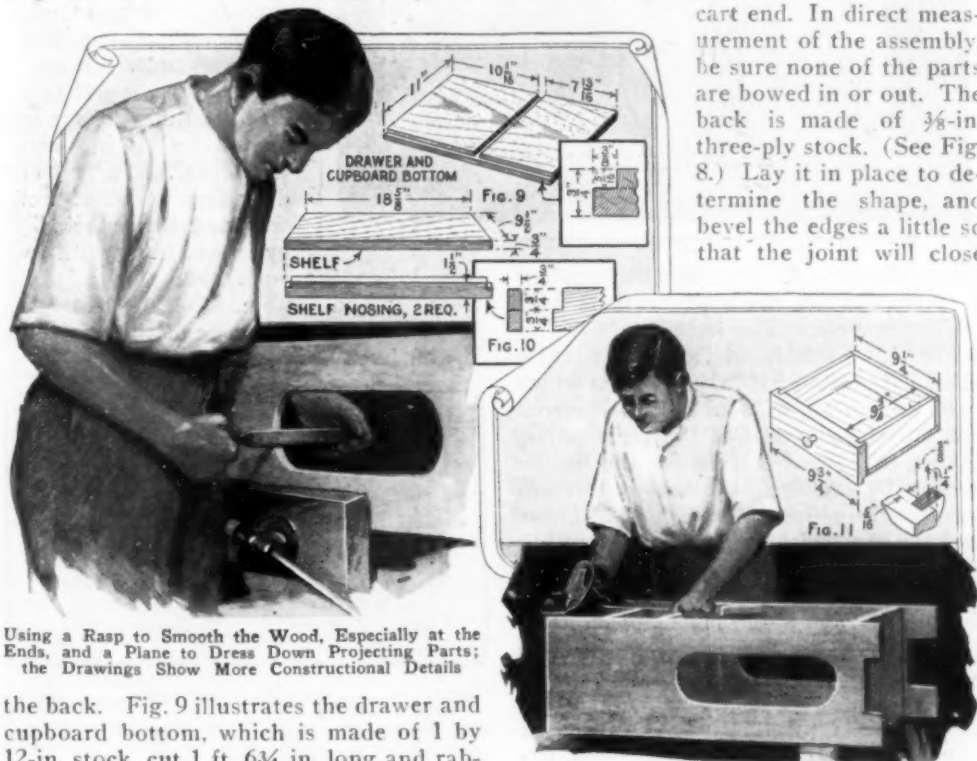
The dimensions of the partition are given in Fig. 4. This piece is of 1 by 12-in. stock, cut 1 ft. $2\frac{1}{16}$ in. long. On one side, 3 in. below the upper end, it has a dado, $\frac{5}{16}$ in. deep and $\frac{3}{4}$ in. wide; on the other, a similar dado, $4\frac{1}{16}$ in. above the lower end. Notch the upper $\frac{3}{4}$ in. deep on the front edge, and rip $\frac{3}{8}$ in. off the back edge from the lower end up through the lower dado. Rabbet as shown for the tray ends, as well as for the three-ply back. The bucket-crate bottom, shown in Fig. 6, is 11 by $10\frac{1}{16}$ in. and rabbeted $\frac{5}{16}$ by $\frac{5}{8}$ in. for the back. The tray bottom is $8\frac{1}{8}$ in. long and $10\frac{5}{8}$ in. wide, allowing room for

beted on the back edge, $\frac{5}{16}$ in. deep, to receive the back. The dimensions of the bottom shelf are given in Fig. 10. The nosing, applied after assembly of the cart, is $\frac{3}{4}$ in. by $1\frac{1}{2}$ in., with the ends notched to fit into the end dados and between the cart endpieces.

Before assembling, plane and sand the unsanded sides of the main parts. Try the joints for fit. If too tight, dress the ends of the pieces mating with the dados. Clamp together and secure with six-penny finish nails, driven in at various angles to increase their holding power. Whenever possible, as in the cart ends, conceal the nails by driving them from the undersides of the shelves into the dados. If any edges project, dress them off. Square the frame, holding it so with a diagonal brace tacked across the front.

The tray sides, shown in Fig. 7, are $\frac{3}{4}$ by 3 by $8\frac{1}{8}$ in. in size. Their position in the assembly is shown in Fig. 1. From actual measurement of the cart, make two bucket-crate rails, shown in Fig. 5, notched at the ends to fit into the partition. The other ends fit flush into the notches of the

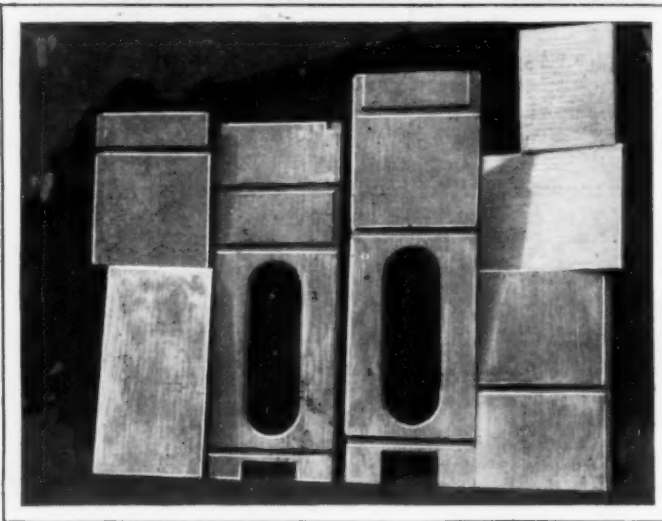
cart end. In direct measurement of the assembly, be sure none of the parts are bowed in or out. The back is made of $\frac{3}{8}$ -in. three-ply stock. (See Fig. 8.) Lay it in place to determine the shape, and bevel the edges a little so that the joint will close



Using a Rasp to Smooth the Wood, Especially at the Ends, and a Plane to Dress Down Projecting Parts; the Drawings Show More Constructional Details

the back. Fig. 9 illustrates the drawer and cupboard bottom, which is made of 1 by 12-in. stock, cut 1 ft. $6\frac{3}{4}$ in. long and rab-

How Dadoes Are Marked from One Endpiece to the Other, and, Below, the Various Parts



snugly all around. Put the shelf nosings in place, and set the four brackets with a $\frac{1}{4}$ -in. margin. The latter are detailed in Fig. 1. Each is an isosceles triangle with a hypotenuse $5\frac{1}{2}$ in. long, from which is cut out an arc of 2-in. radius, centered 4 in. from the vertex of the right angle. Make a cardboard pattern for the handle brackets by sketching the outline through 1-in. squares, as indicated in Fig. 1. These brackets can be easily shaped by cutting into the outline with a saw and trimming with a chisel and rasp. Cut a handle from a broomstick and bore sockets, $\frac{1}{4}$ in. deep, in the brackets to receive the ends of the handle. Nail the brackets in place with the lower edges 10 in. from the tray top, showing a margin of $\frac{1}{4}$ in. They may be further stiffened by nailing a small tri-

angular hardwood block behind each. Under the bottom shelf mount the wheels, centering 4 in. from the end of the cart, as in Fig. 1, laying the axle in a groove on the underside of a 2 by 2-in. stick, which may be built up from 1-in. scrap.

Fig. 11 gives the dimensions of the drawer. The front is made from a piece cut from an end. The two sides, back and bottom are made of $\frac{3}{8}$ -in. three-ply stock. The sides measure 4 by $9\frac{3}{4}$ in., the back 4 by $9\frac{1}{4}$ in., and the bottom $9\frac{1}{4}$ by $10\frac{1}{8}$ in. Dado the ends into the front, $\frac{5}{16}$ in. deep, and fit the bottom into a $\frac{3}{8}$ by $\frac{3}{8}$ -in. rabbet on the lower edge of the front. Nail $\frac{3}{16}$ by $\frac{3}{4}$ -in. guide strips against the sides of the drawer space, the ends being $\frac{3}{4}$ in. back for stops, and slip the drawer in place to mark the length of the front. Cut the ends, and plane the top until it will enter. The clearance all around should be $\frac{1}{16}$ in., when the front is flush. The door is a piece of well-seasoned 1-in. stock, $7\frac{1}{2}$ by 10 in., hung with two 2 by $1\frac{1}{2}$ -in. loose-pin butts placed $1\frac{1}{4}$ in. from top and bottom. A $\frac{1}{4}$ by 1-in. strip is nailed at the right side of the cupboard $1\frac{3}{16}$ in. from the front, for a stop.

MATERIAL LIST

- 1 piece, 1 by 12 in. by 6 ft., pine, S4S, sanded.
- 1 piece, 1 by 12 in. by 8 ft., pine, S4S, sanded.
- 1 piece, $\frac{3}{8}$ by 20 by 24 in., 3-ply veneer.
- 1 pair 2 by $1\frac{1}{2}$ -in. loose-pin butts.
- 1 elbow catch.
- 2 $1\frac{1}{2}$ -in. glass knobs.
- 1 pair 6-in. disk wheels, with $\frac{3}{4}$ -in. tires.
- 1 axle to fit, 15 in. long, threaded for nut at both ends.
- 1 8-qt. bucket.
- 1 small can of plastic wood.

Fill the nail holes with plastic wood, sandpaper the cart to a smooth surface, and paint as desired.

How to Clean White Kid Gloves

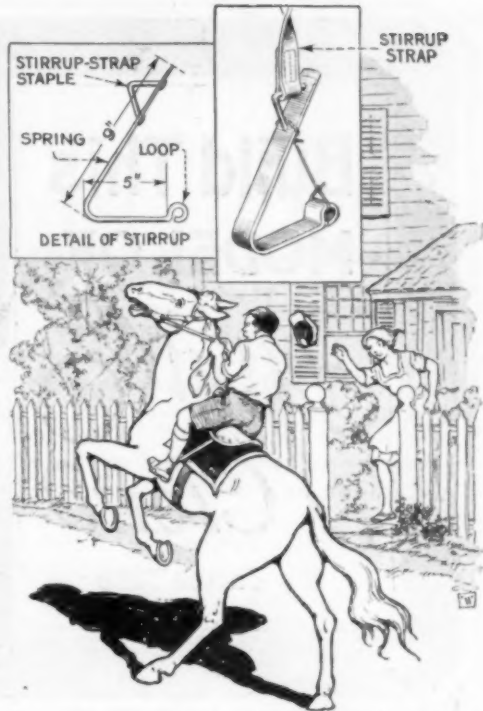
To clean white kid gloves without the use of benzine, gasoline or any other like inflammable substance, proceed as follows: Make a strong solution of any good soap in hot milk and to each pint or so of liquid add the yolk of an egg. Place the gloves on the hands and wash as you would with other materials, running a dry cloth through them after the washing process to force out as much liquid as possible. It has been found that this method has many advantages. The leather will not become stiff, will not stain easily and will have the same appearance as when new, after it has dried.

Improvised Long-Handled Jack

A broomstick, used as shown in the accompanying illustration, makes a long-lever auto jack out of an ordinary short-handled one. All that is necessary to do is to drill a hole in the end of the jack handle, fasten a metal strip to the end of the broomstick and bolt the two together. The broom handle should be of such a length that it can readily be stored in the car and, as it is fastened to the jack handle by means of bolts and a thumb-screw, it is quickly detachable to facilitate storing of the equipment.



Broomstick Bolted to Jack Handle Gives Motorist Considerable Leverage

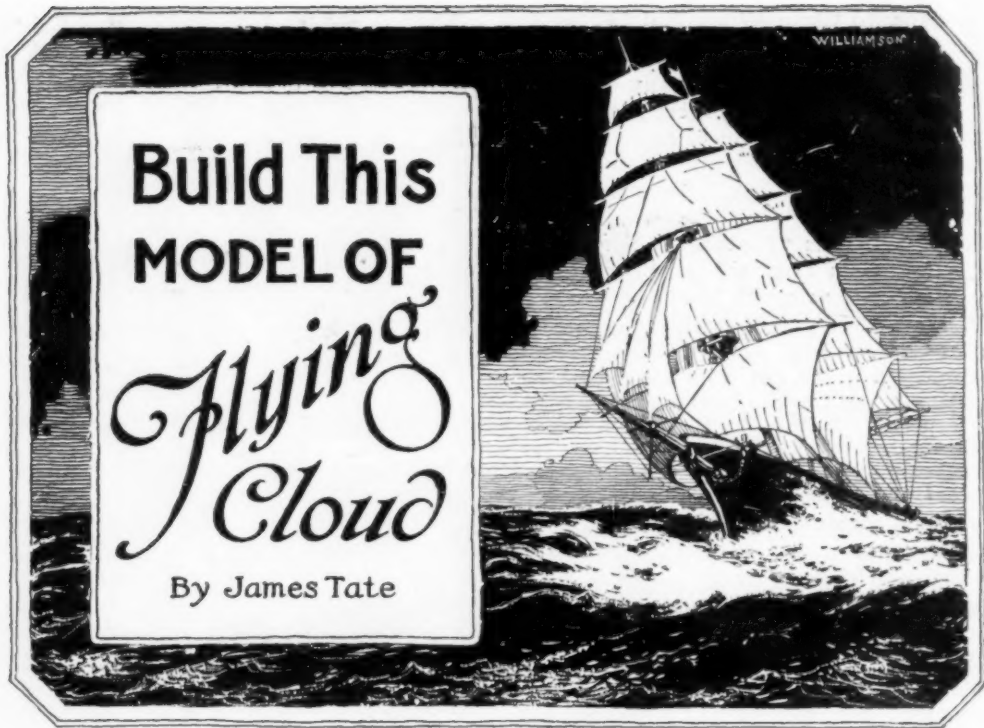


Saddle Stirrup Which Is Especially Made to Insure Safety for Child Riders

Safe Saddle Stirrups

Many kinds of saddle stirrups involve more or less danger for children riders, as the foot is apt to slip through the stirrup and it is then very difficult to release, especially if the horse is moving. Serious accidents have occurred in this way and therefore the safe stirrup shown in the drawing was devised. It is made from an old buggy spring, heated to remove the temper and bent to the shape and size shown. An old shoestring can be tied, as indicated, to keep the foot in the stirrup when the horse is going fast. If the foot should slip through the stirrup and the child should fall, the string will break and release the child. It is, therefore, essential that a string is used which will break in case this should happen.—Luther Strosnider, Onaga, Kans.

☞ When a gilt picture or mirror frame is badly spotted and must be cleaned, brush it with the white of an egg, which is then rubbed off with a soft cloth; this method will not injure the finish.



THE names of the various masts and spars of a ship are often confusing to the amateur, although the system is really very simple, once explained. Starting from the bow, the first mast is the foremast, the second the mainmast and the third the mizzen. These names, however, are only applied by the sailor to the lower masts. Each mast consists of two or more separate "sticks." Taking the fore as an example, the lower stick is the foremast; above this, and joined to the lower mast by the crosstrees and cap, is the fore topmast; above this again are the topgallant, royal and skysail masts, in the order named. The last three are usually in one stick, and they

are so in our model. The same system applies to the yards that carry the sails. The lower yard on the foremast is the fore yard; the next above, the topsail yard (the yards being named from the sails), then the topgallant yard, the royal yard and the skysail yard. Topgallant is usually abbreviated to t'gallant (and pronounced t'garn) and skysail to skys'l.

One of the things that spoils the appearance of the ordinary ship model is that the spars, especially the upper yards, are far too heavy for good proportion. The measurements given for the spars in this model will be found somewhat difficult to work to in the case of the royal and skys'l yards, and

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 December, 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.

they can be increased in diameter slightly, if the dimensions given are found too delicate. They can be made to these sizes, with patience, and the builder is urged to keep close to the diameters given, so that the appearance of the finished model will be as fine as possible. The lengths, of course, must be adhered to strictly.

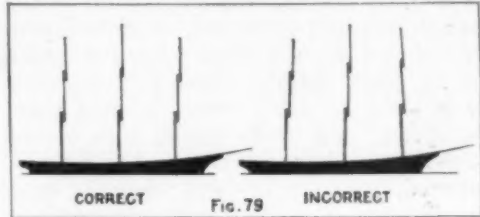
When drilling the holes in the deck for the lower masts, drill so that the masts, when set in place, will present the appearance shown at the left in Fig. 79. Do not allow the masts to lean together at the top; they should spread a little. Do not give them too much rake or slant aft. The foremast should rake back about 1° at the skys'l pole, the main a trifle more and the mizzen just a little more. Drill the holes in the deck at least 1 in. deep and preferably two inches.

The lengths and diameters (in inches)

LENGTH OF MASTS, INS.			
	FORE	MAIN	MIZZEN
A	6½	7 ¾	5 ¾
B	1¾	1¾	1¾
C	3¾	3¾	2¾
D	¾	1	1
E	2¼	2¾	1 ½
F	2	2¾	1¾
G	1½	1¾	1¼
H	¾	¾	½

DIAMETER OF MASTS, INS.			
	FORE	MAIN	MIZZEN
LOWER	¾	¾	¾
TOPMAST	¾ TO ⅞	¾ TO ⅞	¾ TO ⅞
T'GALLANT	¾ TO ⅞	¾ TO ⅞	¾ TO ⅞
ROYAL	¾ TO ⅞	¾ TO ⅞	¾ TO ⅞
SKYSAIL POLE	¾ TO ⅞	¾ TO ⅞	¾ TO ⅞

of all masts are given in Fig. 80, and the key to the lettering will be found at the right of the same drawing. The length



of lower masts (A plus B) is the length above deck, and to this must be added the length that is set into the deck. The length of the topmasts is obtained by adding lengths B, C and D together, plus ¼ in. for the heel of the mast, and the combined length of the t'gallant, royal and skys'l masts by adding together dimensions D to H inclusive, plus ¼ in. as for the topmast.

In making the masts, either of two methods may be adopted. They may be made of ordinary round dowel stock, which may be purchased true to size in 3-ft. lengths, or they may be split from

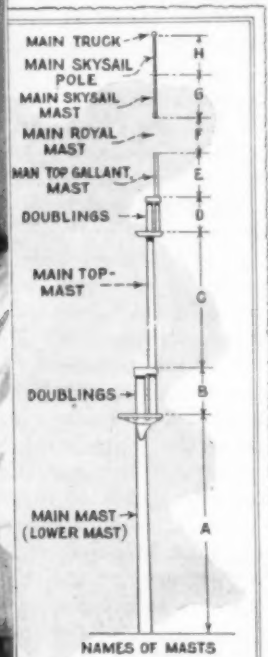
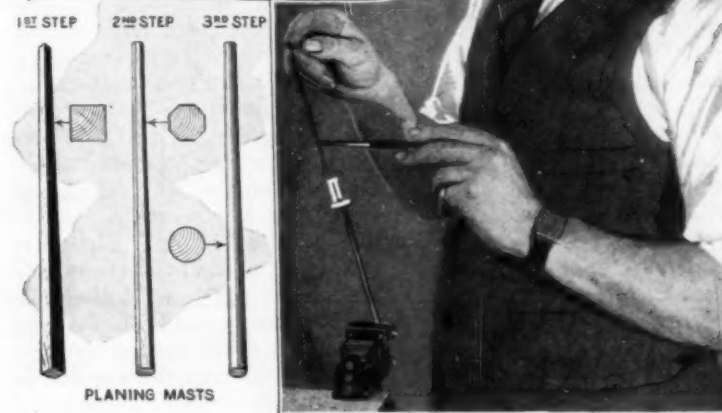


Fig. 80

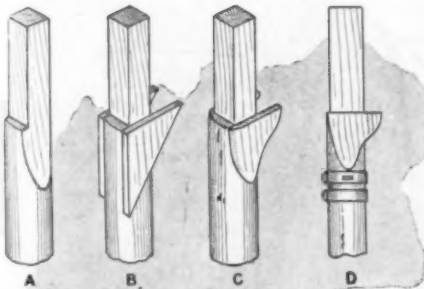
clear straight-grained spruce or white pine. If dowel stock is used, select the straightest pieces you can obtain. If spruce, do not saw the lengths out of the board, but split them out, so as to insure straight grain. When rounding the spruce masts, plane them up square to size first, then plane off the corners, making them octagonal, and finally round with coarse and fine sandpaper. Where the mast is tapered, plane the taper in while the mast is still square; don't attempt to round and taper it at the same time, or to taper after rounding. The lower masts in this model have no taper, and the upper ones very little taper to each individual mast.

Dimensions B and D in Fig. 80 indicate the "doublings," where the upper mast overlaps the lower. The lower masts being cut to length and fitted to the hull, file the masthead down square for the length of the doublings, B, plus $\frac{3}{16}$ in. for the width of the trestle trees. These are the fore-and-aft timbers that support the crosstrees and the top. On the lower masts they rest on "cheeks" (Fig. 81), and the method of fitting the cheeks is shown in Fig. 81. File down the sides of the mainmast, below the squared head, for a length of $\frac{3}{4}$ in., as shown at A, then glue on two triangular pieces of $\frac{1}{16}$ -in. wood. When the glue has hardened, carve and file the cheeks to the shape shown at C and D. No cheeks are used on the topmasts. Cheeks on foremast are $\frac{5}{8}$ in. long and on mizzen $\frac{1}{2}$ in.

For the trestletrees of the mainmast, cut two slips of $\frac{1}{16}$ -in. hardwood, $\frac{3}{16}$ in. wide and $1\frac{1}{16}$ in. long. Clamp these together in the vise and file four $\frac{1}{16}$ -in. square notches across the pair to take the crosstrees. (See Fig. 82.) The position of the notches is marked from the square masthead. Note that the crosstrees form a square hole forward for the heel of the topmast, and another immediately aft of this for the mainmast head. Cut the notches so that the masts will be a neat fit. Make the crosstrees $1\frac{1}{16}$ in. long, glue in place, making sure that all are square, then file the underside of the crosstrees to a taper, as shown in the rear view of top, and cut the underside of the trestletrees to the shape shown in the side view. Drill small holes with a No. 60 drill in the outer ends of the crosstrees. Cut

the top from $\frac{1}{16}$ -in. wood or celluloid as shown in the plan view, cut the square hole as indicated and glue on top of the crosstree assembly. Drill the No. 60 holes through the top and, on the forward curves of the top, put in four little eyepins on each side, with the eyes underneath. Glue the whole assembly to the masthead, making sure that the top lies parallel to the waterline, regardless of the rake of the mast. The trestletrees and crosstrees for the topmast head are made in exactly the same manner, except that there are only two projecting crosstrees instead of three, and no top platform. The lengths of the lower-mast trestletrees on the fore and mizzen are $1\frac{1}{16}$ in. and $1\frac{1}{16}$ in., respectively, and of the crosstrees, $1\frac{1}{4}$ in. and $1\frac{1}{16}$ in. The trestletrees on fore, main and mizzen topmast heads are $\frac{3}{4}$ in., $\frac{7}{8}$ in. and $\frac{3}{4}$ in., respectively, and the crosstrees $1\frac{1}{16}$ in., $1\frac{1}{16}$ in. and $\frac{7}{8}$ in., in the order named. The heels of the upper masts are supported on the trestletrees by a "fid" which in our model is a pin driven through the heel of the mast, about $\frac{1}{8}$ in. from the lower end, as in Fig. 83.

The upper masts are further bound to the lower by means of the caps. These may be of wood, metal or celluloid. To make a wooden cap, cut a piece of boxwood from an old rule, and file down to $\frac{1}{8}$ in. thick. File a little round tenon (Fig. 84) on the square masthead, then drill two holes in the boxwood, located so that the space between the two masts, when the cap is fitted, will be the same as the width of the crosstree between the two. File the cap sides down to the shape shown, making it as narrow as possible. To make a metal cap, cut a piece of thin shim brass, $\frac{1}{8}$ in. wide, set the masts together as in Fig. 85 (or two scrap pieces the same size) and bend the brass around them as shown. Solder the rear lap, then fill in the space between the masts with a drop of solder, remove and dress up square. A spring clothespin will hold the assembly while soldering. There are several bands to go around the masts, and these are made in a similar way, as shown in Fig. 87. The futtock bands shown here hold the lower ends of the futtock shrouds coming from the tops, and the eyepins to which the ends of the shrouds are secured should be fastened to the band with a



SQUARING LOWER MASTHEADS AND FITTING CHEEKS

Fig. 81

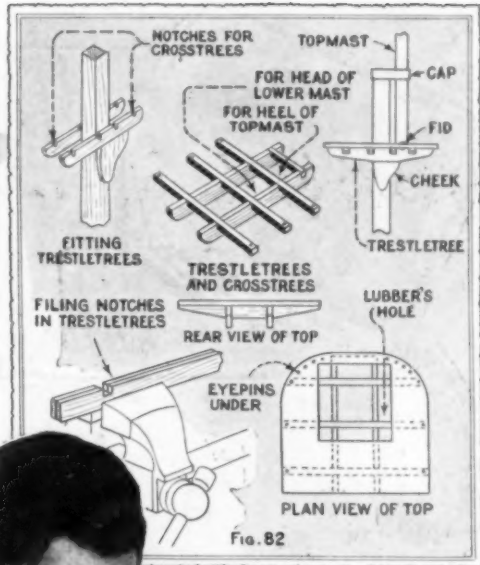


Fig. 82

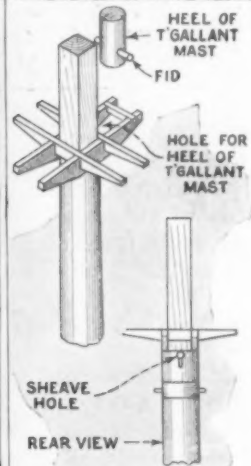
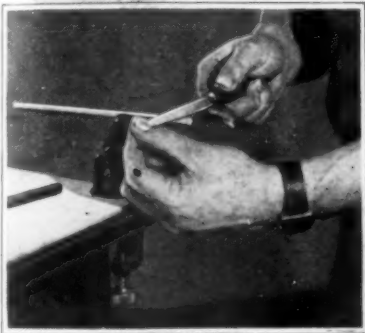
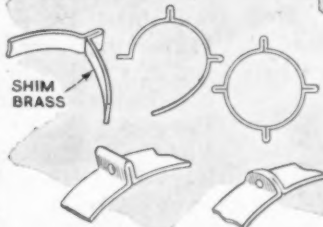
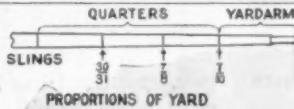
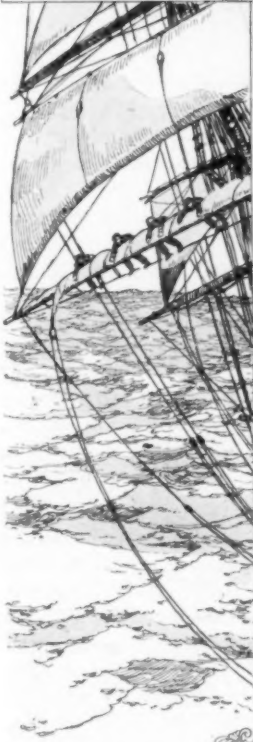


Fig. 83



METHOD OF FORMING MAST AND YARD BANDS

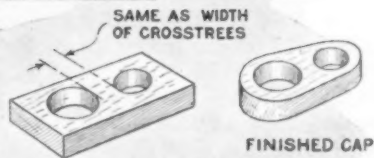
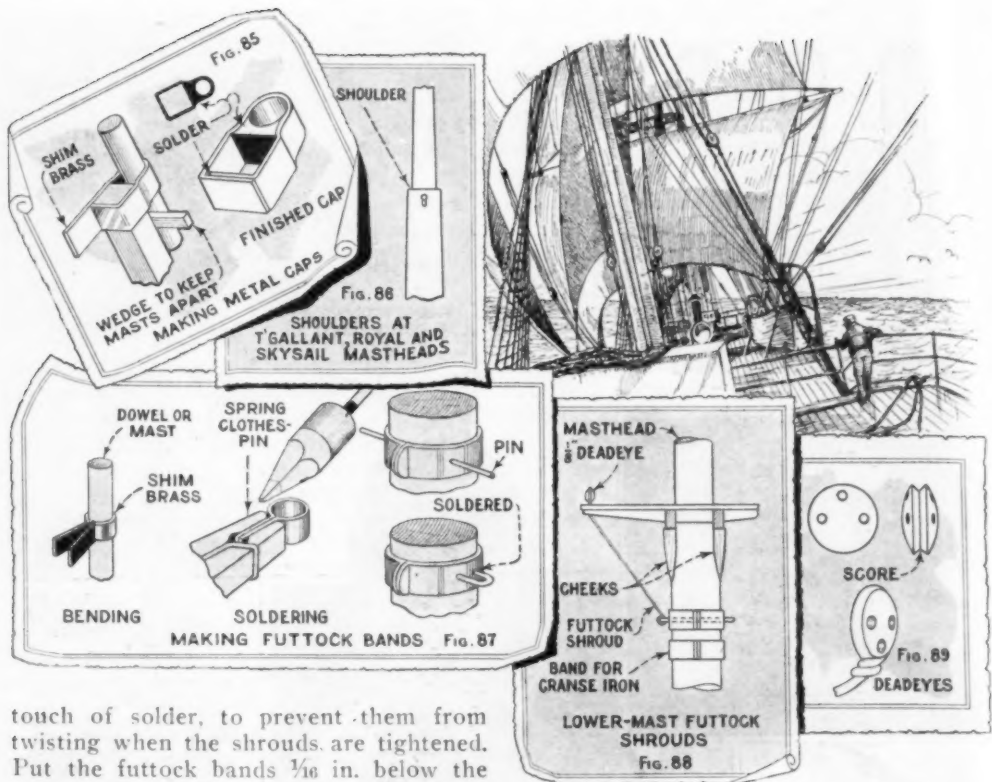


Fig. 84

MAKING BOXWOOD OR CELLULOID CAPS



touch of solder, to prevent them from twisting when the shrouds are tightened. Put the futtock bands $\frac{1}{16}$ in. below the ends of the cheeks on the lower masts, and $\frac{3}{8}$ in. below the trestletrees on the topmasts. About $\frac{1}{16}$ in. below the futtock bands, on the lower masts, are the crane-iron bands, made in the same way; the pin of the crane irons, described later, will hold these in place. If the builder wants to put the deadeyes in the tops at this stage he can. Use $\frac{1}{8}$ -in. deadeyes, twist a piece of No. 30 soft-iron wire around the score (Fig. 89), pass through the hole in the top and crosstree and hook around the eye in the futtock band, Fig. 88.

When tapering the t'gallant, royal and skys'l masts, don't forget to make a decided shoulder at each masthead, as shown in Fig. 86, to carry the gangs of backstays and stays that will be rigged here. Drill a small hole just under each masthead to serve as a sheave hole for the yard hal-yards.

There are two more bands to be placed on the mizzen, the gooseneck and belaying-pin bands, Fig. 90, and these are also of shim brass. The first-named carries the gooseneck of the spanker boom, and forms a bracket for the lower end of

the spencer or trysail mast that runs from the top to the deck just behind the mizzen. This mast is only $\frac{3}{16}$ in. in diameter, and is best made from a straight length of wooden applicator. The upper end is set in a small hole in the top, and the lower in a slight depression in the deck. The belaying pins for the other band can be $\frac{1}{2}$ -in. lengths of common pins, soldered as shown.

The lengths and diameters of the bowsprit and jibboom are shown in Fig. 93, and details of the rigging in Figs. 91, 92 and 93. The bobstay chains should not be heavier than 14 links to the inch, and the martingales 20 links to the inch. The dolphin striker is $\frac{1}{8}$ in. in diameter and $1\frac{3}{4}$ in. long, fitted with a hook at the upper end and with four eyes at the lower, with two hooks on each side, spaced evenly. Put the bowsprit shrouds and the bobstays on first, setting the first up with small rings and a lanyard (Fig. 93) and the bobstays with $\frac{3}{16}$ -in. deadeyes and a black button-thread lanyard. Be sure to arrange the deadeyes with the holes cor-

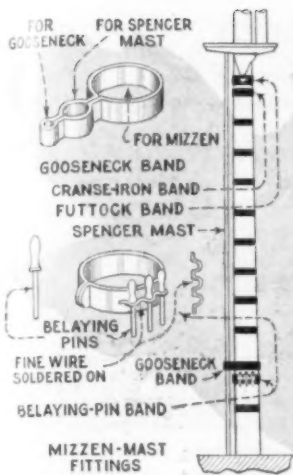


Fig. 90

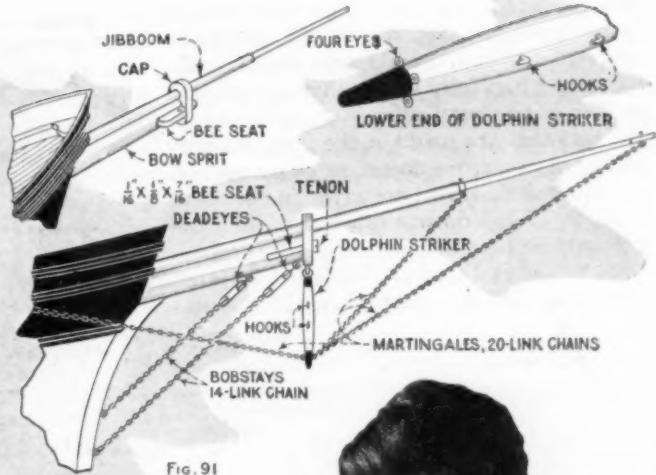


Fig. 91

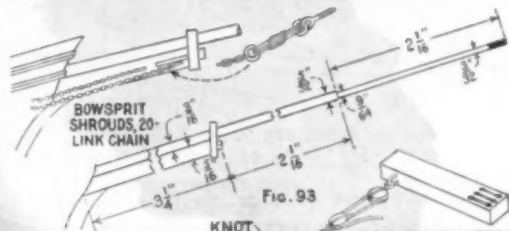
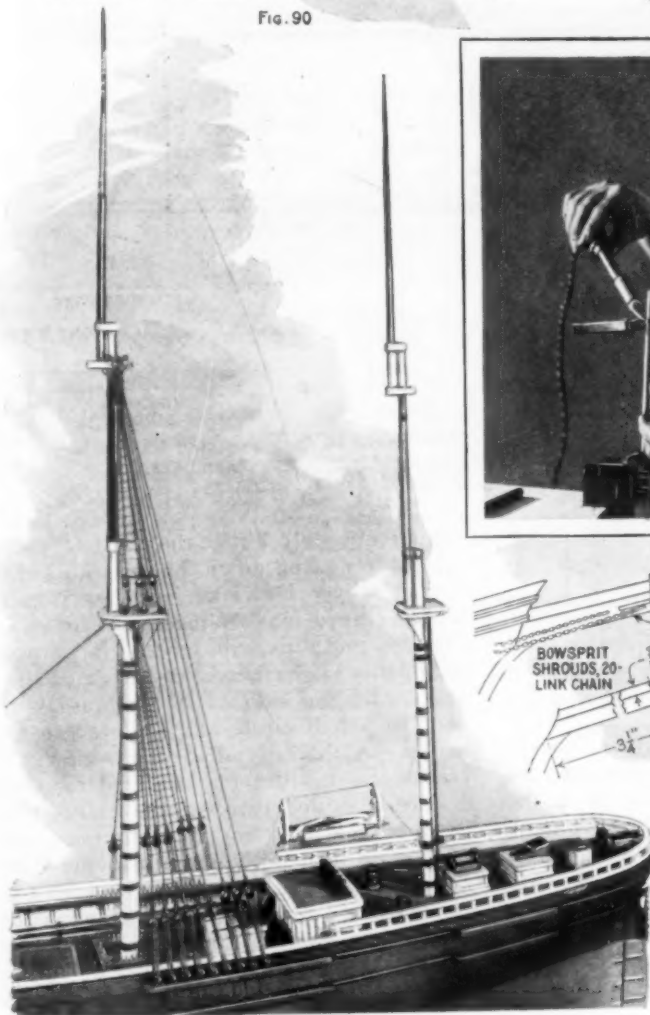


Fig. 93

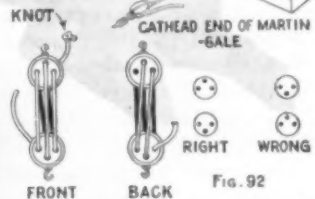
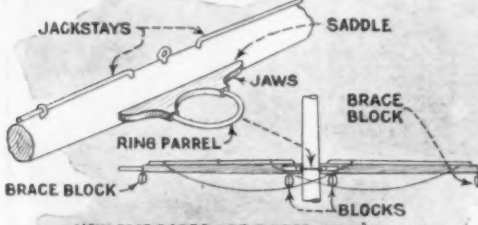
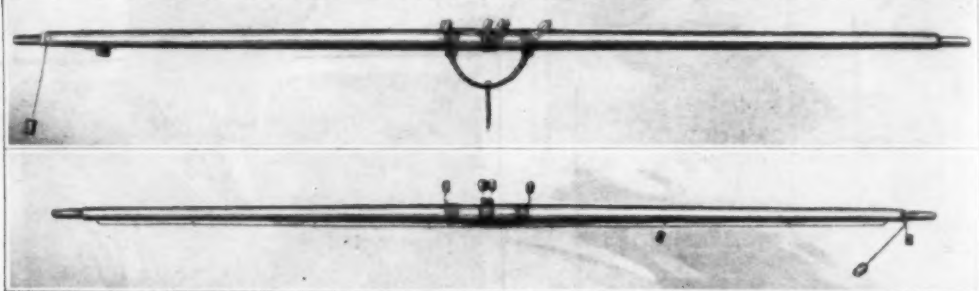
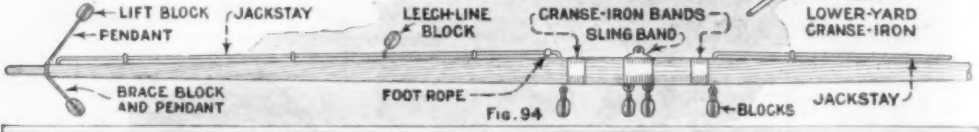
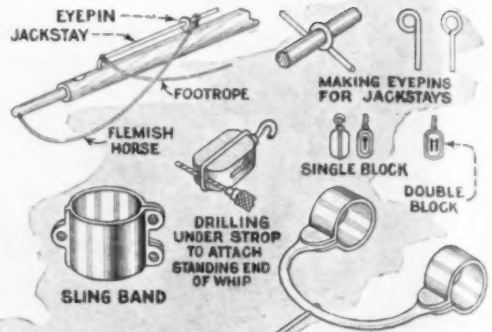


Fig. 92

REEVING LANYARD THROUGH DEADEYES

rectly placed, Fig. 92. The ends of the martingales are set up to the catheads, close to the rail, with single blocks, taking care when fully set up that the dolphin striker hangs vertically.

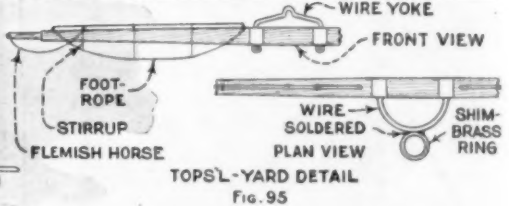
The yards are made in the same manner as the masts, from dowel stock or spruce, and their dimensions are given in the table, Fig. 99. They do not taper straight from the center to the ends, but the proportions are as in Fig. 84. The yard, on each side, is divided into quarters, and the diam-



HOW FOOT ROPES ARE FITTED ON T'GALLANT, ROYAL AND SKYSAIL YARDS Fig. 96



FOOTROPES ON JIBBOOM Fig. 97



TOPS'L-YARD DETAIL Fig. 95

eter at the first quarter mark is ³⁰/₃₁ of what it is at the center or slings, at the second quarter the diameter is ⁷/₈, at the third ³/₅ and at the end ¹/₂ of the sling diameter. Taper one yard according to this rule, and you will be able to taper the others by eye.

The lower yards are held to the masts by cranse irons, trusses or cranes, as they are variously called. The cranse iron

should not only allow the yard to move vertically up and down, but also to swing horizontally. However, a very good model cranse iron is made as shown in Fig. 94, and this will serve our purpose excellently. The bands are made of shim brass, and the iron of ¹/₁₆-in. brass wire, bent to a half circle and soldered to the bands. A hole is drilled through the center and a stout pin soldered in, then a hole is drilled through the cranse-iron band on the mast and into the mast and the cranse-iron pin slipped into the hole. By bending the pin slightly, the yard can be set square across the hull, which is the way we will want it. The sling band at the center of the lower yard is bent up in the manner shown in Fig. 84, and finished as

in Fig. 94. The jackstays on top of the yard, to which the sail is fastened, are made for the lower yards of No. 24 iron wire. They must, of course, decrease in size in proportion to the size of the yards, as you go up. When making the eyepins that fasten them to the yard, use a smaller size of wire and form the pins around the jackstay itself.

If the model is afterward to be fitted with sails, the builder will find it convenient to fit all the blocks shown, to avoid later trouble; if not, the only blocks necessary on the lower yards are the lift and brace blocks at the stops on the yard-arms. Fit these to the yards with twisted-wire pendants to resemble rope, about 1 3/4 in. long.

The topsail yard fittings are shown in Fig. 95. Jackstays, etc., are fitted in the same way as before. The mast ring or parrel should be soldered up and the yard fitted over the mast before the latter is finally put in place, else it will be necessary to leave the ring open. The crane-iron bands may be narrow strips of black paper, glued round the yard, if soldering is difficult, with the ends of the crane iron driven into small holes drilled into the yard through the center of the paper strips. The yoke for the tops'l tye on top of the

ish horse" is a short footrope on the outer ends of lower and tops'l yards, for the man who had to sit astride the yardarm.

The t'gallant, royal and skys'l yards are fitted to their masts as shown in Fig. 96. Glue a thin strip of wood to the after side of the yard, file it to fit the mast, forming the saddle, then file the jaws to shape. The yard is slung to the mast with a wire ring or parrel. Note how the footropes are fitted so as to form an easy curve. They are aft of the yard, but forward of the mast. Footropes for the jibboom are made of knotted thread, and fitted as in Fig. 97. Little need be said about the spanker boom and gaff, except that the gaff tapers from the throat (inner) end to the outer end, while the greatest diameter of the boom is a little aft of the center. The brail blocks may be omitted on a model not intended to be fitted with sails.

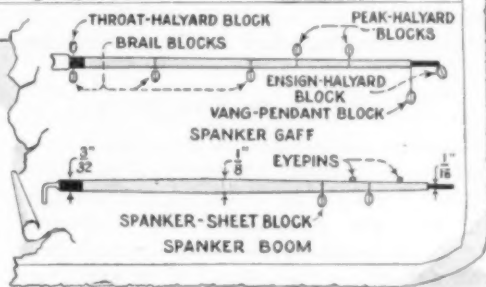
Use 3/16-in. blocks for the lower yards, and decrease the size of the blocks and rigging as you go aloft.

Many of the points that may not be clear in this chapter will become perfectly clear when we come to the rigging, and if difficulty is encountered in determining the purpose of any block or other fitting, put the part aside and go on with something else. It will be found convenient, in any event, to have everything above the lower masts so that it can be taken off readily,



YARD	LENGTH OF YARDS, INCHES			DIAMETERS, INCHES		
	FORE	MAIN	MIZZEN	FORE	MAIN	MIZZEN
LOWER	8 13/16	10 7/16	6 13/16	3/16 TO 3/32	17/64 TO 3/32	11/64 TO 3/32
TOPS'L	6 13/16	8	6 3/4	3/64 TO 3/64	7/32 TO 3/32	3/64 TO 3/64
T'GALLANT	5 1/2	6 8/16	4 13/16	1/8 TO 3/64	3/8 TO 3/64	1/8 TO 3/64
ROYAL	4 1/16	4 7/16	3 1/16	3/32 TO 3/64	3/32 TO 3/64	3/32 TO 3/64
SKYS'L	2 13/16	3 3/32	2 13/16	1/16 TO 3/64	1/16 TO 3/64	1/16 TO 3/64
SPANKER GAFF — 4 1/8 LONG; 1/8 TO 3/64 DIAMETER						
SPANKER BOOM — 7" LONG; 3/32 TO 1/8 TO 1/16 DIAMETER						

Fig. 99



yard can be fitted similarly. The footropes, on which the men stood to take in and stow sail, are fitted on the after side of all yards, and may be either of fine black thread or of fine wire, painted black, with the stirrups soldered to them. The "Flem-

as, if all masts and yards are fitted permanently, they will be found to make the job of fitting the standing rigging much harder.

Paint all lower masts, tops, trestle and crosstrees, doublings and caps flat white. Stain the topmasts, t'gallant, royal and skys'l masts medium oak, outside of the doublings. Stain the spencer mast and the yards in the same way. Paint the ends of the yards outside the stops, and all yard fittings, black, and varnish all stained

and black work. Stain the blocks light oak. The bands on the lower masts are simply made by gluing strips of black passe-partout paper, $\frac{1}{8}$ in. wide, around the masts after painting, although of course, they can be painted on if the worker is skillful enough. Space these bands $\frac{3}{16}$ in. apart. Use the paint thin, but put on enough coats to cover the wood thoroughly.

(To Be Continued)



A Rope and a Weight
on Clothesline Pole
Hold Line Steady

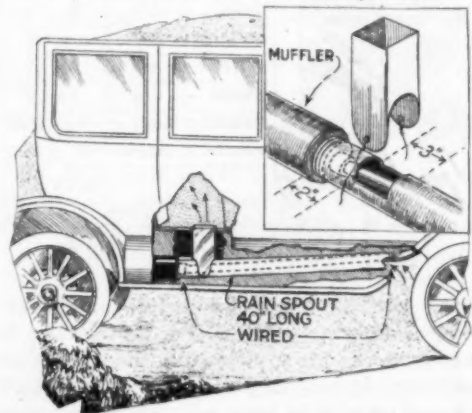
Preventing Clothesline from Blowing against Trees

The arrangement illustrated herewith has successfully prevented clothes on the line from blowing against near-by trees or other objects. All that is necessary is to guy the pole with a length of rope having a weight attached at the lower end to be placed on the ground. This will hold the pole, although, on a day when the wind has a tendency to shift, it may be necessary to provide a weight on each side.

Heater for the Ford Sedan

During cold weather it is often desired to have a heater in the car. A good one for the Ford sedan is shown in the drawing and can be made in the following way: A length of ordinary galvanized-iron conductor pipe, about 40 in. long, has

a hole, 3 in. square, cut in it about 2 in. from one end. Slip the conductor over the exhaust pipe in the position indicated, just ahead of the muffler. The hole in the conductor pipe should then be directly under the floorboards behind the front seat. Both ends of the conductor are securely wired to the muffler and exhaust pipe. A short length of square conductor, cut to fit snugly over the hole in the round one, is attached vertically, the upper end projecting through a hole cut in the floorboards. A piece of heavy wire mesh is tacked down on the floorboard over the opening, and the floor mat is cut to correspond. If too much heat comes out, the cut-out section can be slipped back in place over the opening. In use, the air enters the front end of the conductor pipe, is warmed by coming in contact with the hot exhaust pipe, and is conducted into the car. The rear end of the pipe should be closed by butting it against the muffler or by filling it with asbestos paper, for a considerable amount of warm air will otherwise be lost at this joint.



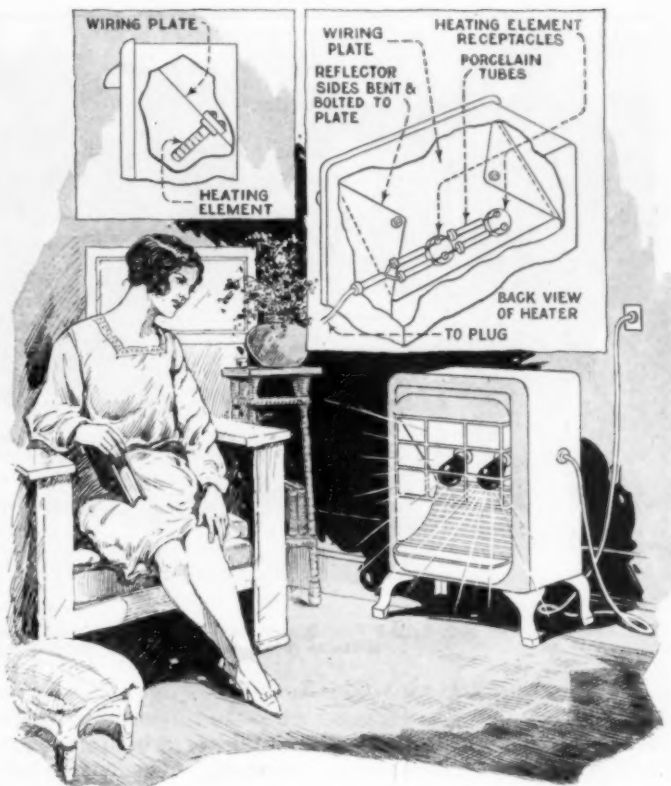
Efficient Homemade Exhaust-Pipe Heater for Ford Sedan Can Be Made from Conductor Pipe

Gum for False Mustaches

Often the amateur actor is at a loss to find a suitable adhesive for sticking on a false mustache or beard, especially when he has made his own and there is no theatrical-supply store in the vicinity. A gum that is readily soluble is preferred, and the kinds given below can be made from ingredients obtainable at any drug store. The first is made by dissolving 1 oz. of mastic in 2 oz. of ether and 4 oz. of grain alcohol. The second is somewhat more professional and is composed of mastic, 1 oz.; sandarac, 4 oz.; rosin, 12 gr.; ether, 2 oz., and alcohol, 16 gr. Keep these solutions in a tightly corked bottle and apply with a small brush. When using, first clean the skin, dry it and apply the gum to the skin and to the gauze on the back of the false hair; then press the two together, holding them a moment until set. To remove, strip off quickly and wash the skin with alcohol. In emergencies, it will be found that ordinary colodion will serve for the same purpose.—L. B. Robbins, Harwich, Mass.

Electrifying an Old Gas Heater

An old gas heater can easily be made up to date by electrifying it, for the reflector will serve the same purpose, whether gas or electricity is used. To make the change, remove all the gas burners and fixtures from the interior, which usually will leave holes that can be used for wiring. A piece of galvanized sheet metal is cut to fit across the inside of the stove, as indicated, the ends being bent at right angles so that they can be attached to the sides with screws. Through the sheet, two 2½-in. holes are cut for electric-sign receptacles, which are fas-



A Simple Way of Transforming a Gas Heater into an Electric Heater at a Slight Cost and Little Work

tened in place securely. After this has been done, the plate is screwed in place, in the manner mentioned above. The detail drawing shows how the receptacles are wired with No. 10 bare copper wire, porcelain tubes being used to protect the wires from heat, and to eliminate short circuits. A heavy-duty two-wire stranded cable of the kind used for flatirons, about 6 ft. long, is connected to the wire and passed through a porcelain tube inserted in the wall of the heater, a plug being provided at the other end for attachment to an electric outlet. Two heating elements of the screw-plug type are obtained from a hardware store and are screwed into the receptacles. Such a heater is easily portable for moving from one room to another, wherever required. The cost of the material is only about \$2.50.—David Baxter, Hutchinson, Kans.

☐ A white spot on furniture varnish may be removed by holding a hot iron over it.



Old Auto Equipped with Spiked Rear Wheels and Provided with Skid Chains on the Front Wheels, Facilitates the Work of Cutting and Hauling Ice

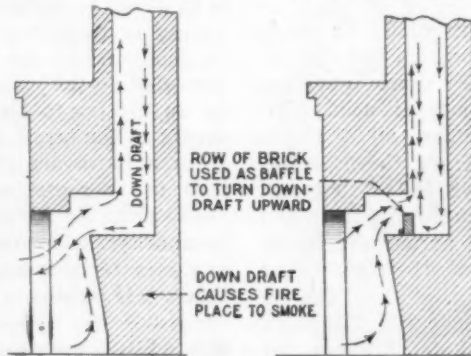
Harvesting Ice with Old Auto

Reuben Currier cuts ice from a pond in Wellesley, Mass. He was particularly anxious to get at the job early this winter, for the first ice was thick and clear. Ordinarily his work requires twenty-five horses and eighty-five men, but both horses and men were scarce this winter so he devised spiked rims for the rear wheels of an old touring car. After that the ice harvest proceeded quickly. First the car was tried with the ice marker and then with the grooving plow, and it was found that a much larger area was covered in this way than with horses. The car was then used for hauling the ice from the far side of the pond to the ice house. It easily towed cakes 100 ft. long, while men laboriously poled cakes only 5 ft. long. The equipment necessary to fit the car for this work was simple. Tires were removed from the rear wheels and in their place,

on each wheel, was applied a demountable rim, fitted with sharpened studs or spikes, which gave excellent traction on the ice. Ordinary skid chains were used on the front wheels, to insure proper steering.

How to Remedy a Smoking Fireplace

Our fireplace smoked whenever a slight wind was blowing, which made it almost impossible to remain in the room. After trying all the usual methods of overcoming the trouble by raising the height of the chimney, installing caps to prevent down draft, etc., the smoking still persisted. However, after careful study of the air and



Smoking Fireplaces Can Often Be Remedied by Providing a Shallow Well Made of Bricks

smoke currents in the chimney, and the action of dampers in the older and successful fireplaces, I decided that an air well would probably remedy the trouble. The arrows in the left-hand detail of the illustration indicate the direction of the air and smoke currents before the

trouble was eliminated, and the right-hand detail shows the path of these currents afterward. All that was necessary was to build up a row of bricks in the position indicated. This baffle provides a shallow well, which turns the down draft upward again, and this draws the smoke up and out of the chimney.—Harold J. Boyd, Orlando, Fla.

Removing Varnish from Antique Furniture

Many amateur craftsmen who have tried to restore valuable pieces of antique furniture, have failed in the attempt because the means of removing the old varnish was not the proper one. The right material to use for this is an equal mixture of alcohol and turpentine. It is poured into a bottle, which is heated by immersing it in hot water. The solution is applied while warm, and it will be found that the old varnish will dissolve at once. The advantage of using this solution is that it can be applied several times to the surface until the latter is free from all old varnish and at the same time it will not destroy the age coloring which is characteristic of antiques.—L. H. Georger, Buffalo, N. Y.

Thermos-Bottle Kink

Thermos bottles are broken usually because they easily slip out of one's hands owing to their smooth casing. Take a piece of an old inner tube, turn it inside out and slip it over the bottle casing. It

will then be easy to hold it or to catch it "on the grab," if it does get away.—F. W. Bentley, Jr., Missouri Valley, Iowa.



Novel Photo Album Consisting of a Number of Prints Similar in Shape and Size



Novel Photo Albums

A novel form of small photo album can easily be made by anyone. A paper mask, as shown in the lower detail, is cut from a piece of opaque paper or thin cardboard. The hole cut in the center should fit the negatives to be used. At one side two holes are cut or punched to enable one to bind the complete album. When using the mask, the negatives are laid in the printing frame, and the prints are exposed and developed in the usual way. The finished print will look like that shown in the right-hand detail. The ends of the paper around the outline of the leaves are cut away with scissors, which can readily be done, as the paper outside of the mask will be black. The prints are folded at one side, as indicated by the dotted lines, so that the leaves will fold over. Covers for such an album can be made from any finished cardboard. They are cut the same size and shape as the leaves and the word "Photographs" can be printed or painted in the center by hand. The back cover requires no lettering and is left plain. A colored ribbon is strung through the covers and leaves to bind them together.

☛ A small brass tube forced through the earth into a gopher hole leaves a channel for charging the nest with poison or gas.



Small Objects to Be Photographed Can Be Enlarged Considerably by Means of a Magnifying Glass

Photographing Objects through Magnifying Glass

Amateur photographers and others sometimes have occasion to make a photo of some small object and secure the largest possible image of it on the negative. Usually photographs of this kind are beyond the limit of their working equipment. Although it is possible to enlarge prints from any good negative, it is desirable to get the largest possible image on the negative. In an effort to accomplish this, I experimented by focusing my camera upon small objects, working through an ordinary magnifying glass. I discovered that the success of the experiment depends on the proper focusing of the magnifying glass with relation to the lens of the camera, and focusing the camera upon the magnified image thus produced. This is quite easy to do with any camera of the reflecting type, one having a ground-glass focusing panel, or by placing a ground glass over the open back of a camera of the "guess-box" focusing type. By magnifying the image through an ordinary 5-in. reading glass, I find that I am able to re-

cord an image in the camera approximately four times the size that the camera will produce ordinarily. To simplify the handling of the reading glass for such work, I made a bracket for it by taking a block of wood and drilling a hole in it to take the handle of the glass. With this arrangement, as indicated, the glass can easily be moved back and forth to obtain the desired focus between the object and the camera.—John Edwin Hoag, Los Angeles, Calif.

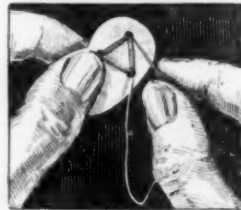
Renewing Typewriter Ribbons

Typewriter ribbons can be made to last much longer by reinking them. A popular method is that of using glycerin, but

the disadvantage of this method is that the letters appear splashy and messy. An equally simple, much more effective means, is as follows: Dip a camel's-hair brush into stamping ink and then hold it against the ribbon, while rewinding the latter. The brush should be rotated slowly while doing this in order to spread the ink evenly over the surface of the ribbon.—Thomas Blaine, Evanston, Ill.

Finger Grip on Mandolin Pick

Mandolin picks are usually made of celluloid and the player must pinch them tightly between his fingers to hold them securely and prevent slipping, which is quite tiresome. A good finger grip can be provided by punching or drilling three small holes in the pick and drawing a length of thread through them, as shown in the accompanying illustration.—Fred Veith, Dansville, N. Y.



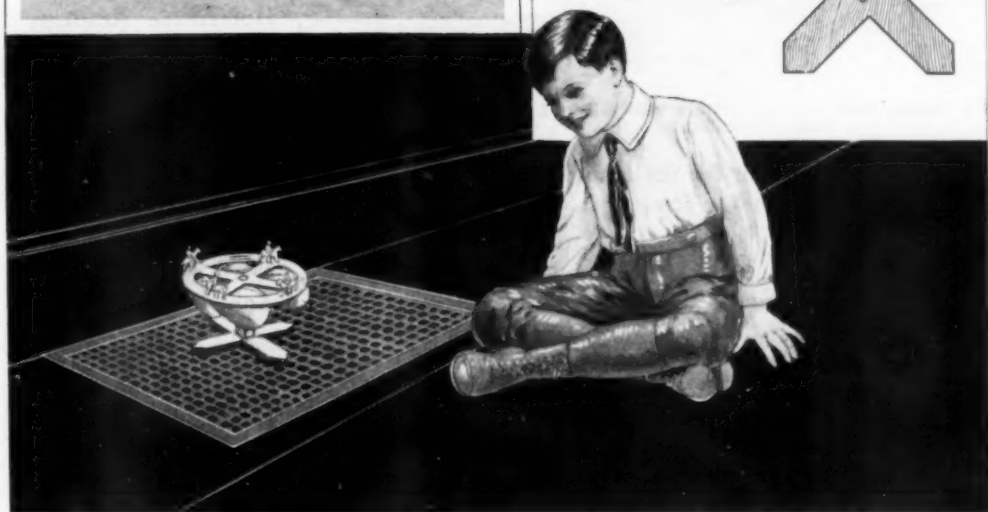
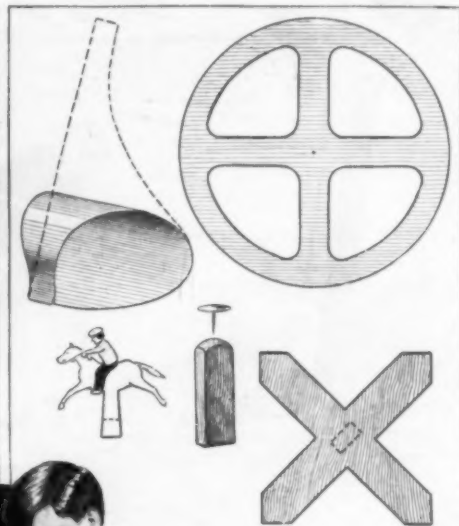
A Simple Toy Merry-Go-Round

By DICK HUTCHINSON

NEARLY every child desires toys with motion. Toys having spring or rubber-band mechanisms are, as a rule, rather short-lived, but the hot-air-propelled merry-go-round, shown in the illustration, will last indefinitely, provided, of course, it is well taken care of.

From medium-weight cardboard cut a 5-in. disk and remove the four sectors, as shown in the upper right-hand detail. Then cut four pieces of ordinary writing paper to the shape indicated by the dotted lines of the detail, and bend them over to

form fans, using glue to hold the overlapping edges together. Glue one of the fans to each of the four crossbars, as in the photo at the left. From a piece of $\frac{1}{2}$ -in. soft wood cut out a base with four extended feet. In the center of the base nail a small post, about 2 in. high. This should be rounded and given a high polish on the top end to reduce friction, as it forms the bearing upon which the disk or wheel revolves. Place the latter on top of the post, balancing it carefully. Fasten it by means of a thumbtack, pressed



Toy Merry-Go-Round Which Whirls at a High Rate of Speed over a Hot-Air Register, Fans on the Toy Catching the Draft and Propelling It

straight into the center of the post, being careful to allow a little play to permit the platform to rotate easily and enlarging also the hole in the wheel a trifle so that the paper will not bind on the thumbtack.

To complete the toy, cut four mounted horsemen from a piece of medium-weight cardboard, bend the base as indicated by the dotted line of the detail, and glue the base to the wheel so that each figure stands

upright and is headed in the direction that the platform will turn. The horsemen must be all exactly the same size and must be distributed on the wheel to balance it. The same, of course, applies to the location of the fans. To operate the toy it is merely placed over a hot-air register and the draft will cause it to rotate, the rate of speed depending on the amount of draft coming up through the register.



Set Fishing Line on the Ice Has a Number of Leads and Pivoted Flags Which Indicate When Fish Are Caught

Automatic Indicator for Set Fishing Lines on the Ice

Fishing through the ice during winter is usually a cold sport, especially when one has a set line with a number of leads attached, as it is necessary to go from one lead to the other to examine each separately. This objection, however, can be overcome by using an automatic indicator, as shown in the drawing. Two posts are set up, a slot is cut in the top of each, and a short 1 by 2-in. stick with a flag attached, is pivoted in the slot, the set line being attached to the lower end

of the flag sticks. The line is run through a staple or screw-eye so that a pull on the line will cause the flag to rise. When no pull is exerted, the flag drops down again. A number of leads, with sinkers and hooks, are provided, the weight of the leads not being sufficient to raise the flags. When a fish is caught there will be a quick jerk and one or both flags will go up. The lead where the fish is caught can then be easily seen. The fisherman can skate around to keep warm and still keep an eye on his lines.

Homemade Academy Board

Art students use quantities of academy board for painting in oils because it is cheaper than canvas. An excellent board, somewhat similar to this, can be made at home for little or nothing. Get some junkboard or equally heavy cardboard, such as is used to hold lace-curtain stock. Pieces of light-weight wallboard will be satisfactory. Size one surface and allow it to dry. Then spread on a coat of thick paint with a pallet. When two pieces are covered, place the painted surfaces together and then pull them apart carefully. This will give the pieces an even but rough-toothed surface, after which they should be laid down flat and allowed to dry.



All Shop Notes published in 1927, in book form—Fifty Cents—from our Book Department

An Automatic Boiler Man

Simple Attachment, Operated by Cheap Alarm Clock, Makes Boiler Warm House in Morning

MANY are the homemade devices that have been constructed to open the drafts of the hot-air furnace in the early morning, so that the house will be warm when the occupants get up, but similar devices, designed to do the same job on residence steam boilers fitted with pressure

draft regulators, seem to be few and far between. There is no more difficulty in fitting such an attachment to a steam boiler than to a furnace; the one described in this article took approximately an hour to make and has functioned perfectly for two years. It is a great convenience, in

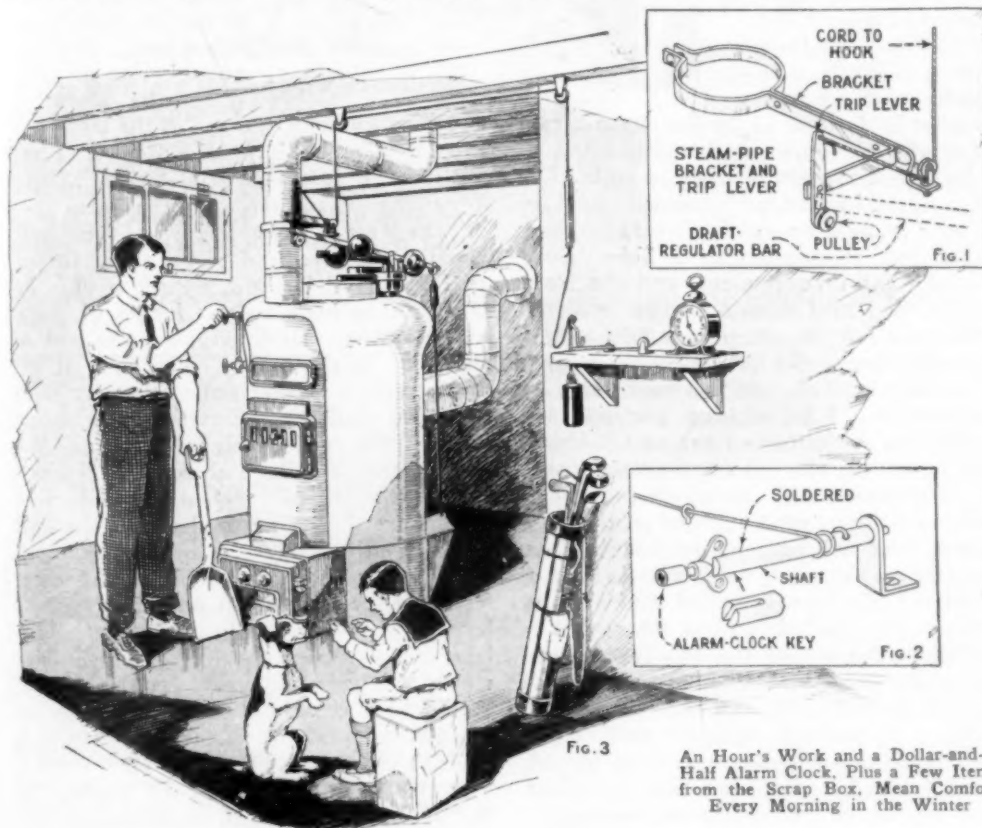


Fig. 3
An Hour's Work and a Dollar-and-a-Half Alarm Clock. Plus a Few Items from the Scrap Box. Mean Comfort Every Morning in the Winter

cold weather, to come out of a chilly bedroom and find the rest of the house at 70°, without having to get up at some unearthly hour of the morning to fire up the boiler.

The basis of the attachment is an ordinary alarm clock. This should be a fairly good one; although the one in the original installation cost only \$1.50, still the better the clock the longer service it will give, and it must be of the type in which the key revolves when the alarm rings.

Boilers of the type mentioned have a diaphragm in a casing on top, which expands and contracts under the rise and fall of pressure in the boiler. Operated by the diaphragm is a weighted lever, which opens and closes the ash-pit and check dampers as the pressure varies. The first thing to do is to make the steam-pipe bracket and trip lever shown in Fig. 1. The clamp part of this bracket is formed to fit the main steam riser from the boiler, and is held firmly to it by means of a couple of stove bolts. The arms of the bracket are extended to within about 1 in. of the regulator lever; here another bolt is inserted in a hole drilled through the bracket arms, and the front arm is then bent parallel to the regulator lever, and cut off an inch or two longer than the latter. On this end the trip lever is mounted. This consists of a strip of flat iron, about 3½ in. long, pivoted on a small bolt at the end of the arm. About 1 in. below the pivot, a small grooved pulley is mounted, and the whole bracket is then so adjusted that the end of the regulator lever will rest on the pulley when the trip is vertical, and will fall clear when the trip lever is pulled backward at the top. A small hole for a stout cord is drilled in the top of the trip lever, then the rear arm of the bracket is twisted and bent as shown in Fig. 1. On this a small pulley is fastened so that the end of the cord from the trip lever can be passed through it; be sure that the regulator lever can move freely past the bracket.

Now to fix up the operating end of the device. Slot the end of a piece of ¼ or ⅜-in. brass rod to fit over the wings of the alarm key, drill a small hole near the other end and solder to the key, Fig 2. Solder two sheet-metal brackets to the clock, as in Fig. 4, so that it can be fastened firmly to a shelf, and mount shelf and clock on the boiler-room wall so that their relation to the boiler is somewhat as shown in Fig. 3. Make and screw to the rear of the shelf a small bracket to act as

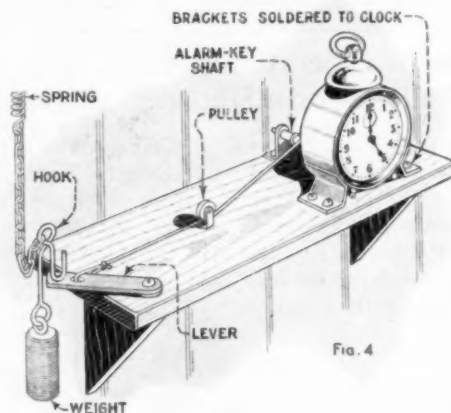


Fig. 4

a bearing for the end of the brass rod. Knot a length of strong fishing line through the hole in the rod, and lead it under a small screw-eye or pulley screwed to the shelf. On the extreme edge of the shelf, pivot the simple lever shown in Fig. 4, and fasten the end of the line to it as indicated. Leave enough line so that, when the alarm is

about half wound, the end of the lever will project about ½ in. over the edge of the shelf. The cord is wound on the alarm-key extension so that, when the alarm goes off, the lever is pulled in toward the clock. Bend a stiff wire hook to the shape shown in Fig. 4, and fasten a weight to it. To the top loop hook a short length of chain and a spring. Directly above the end of the lever, on the ceiling, screw in a pulley, and mount a similar pulley directly over the small-pulley bracket on the boiler. Thread the cord (fishing line) from the end of the trip lever through the small pulley just behind it, then over the two pulleys on the ceiling and fasten the end to the spring at the clock mechanism (See Fig. 3). Set the hook on the shelf lever, adjust the weight on the regulator lever so that it will fall, then pull the trip lever to a vertical position and set the end of the regulator lever on the pulley. Wind the alarm about half, and spring it. The device looks, when in action, like one of Rube Goldberg's cartoons, but it works. The alarm winds up the cord, pulling in the lever on the edge of the shelf, and the

she if pushes the weight off. The weight pulls the trip lever down, thus allowing the regulator lever to drop and open the drafts. The weight need not be a heavy one, since all it has to do is to pull down the trip lever. Don't try to hook the alarm clock directly to the trip lever; it will work all right, but it imposes rather too much strain on the clock. It is better to use the clock merely to throw off the weight, and let the latter do the work.

Bronzing Cast Iron

The following process will be found effective for imitation bronzing of cast iron: Thoroughly cleanse the iron and rub it smooth. Apply evenly a coat of sweet or olive oil and heat, being careful that the temperature does not rise high enough to burn the oil. Just as the oil is about to decompose, the cast iron will absorb oxygen, and this forms upon the surface a brown-oxide skin, which holds securely, and is so hard that it will admit high polish.

An Improved Chuck Wrench

One end of a small chuck-wrench handle can be drawn out to a spoonlike end and makes a very handy and practical tool. It is an ever-ready implement for "flipping" out cuttings or loosening and lifting out stud shells after they have been drilled and broken down with a round-nose chisel. Shaped as a spoon, the end is much easier on the ball of the thumb when tightening the chuck screw.



Handle of Lathe Chuck Wrench Ground Down to Spoon Shape Adds to Its Usefulness

Old Truck Tire Rims Can Be Used to Make a Convenient Foundry Flask

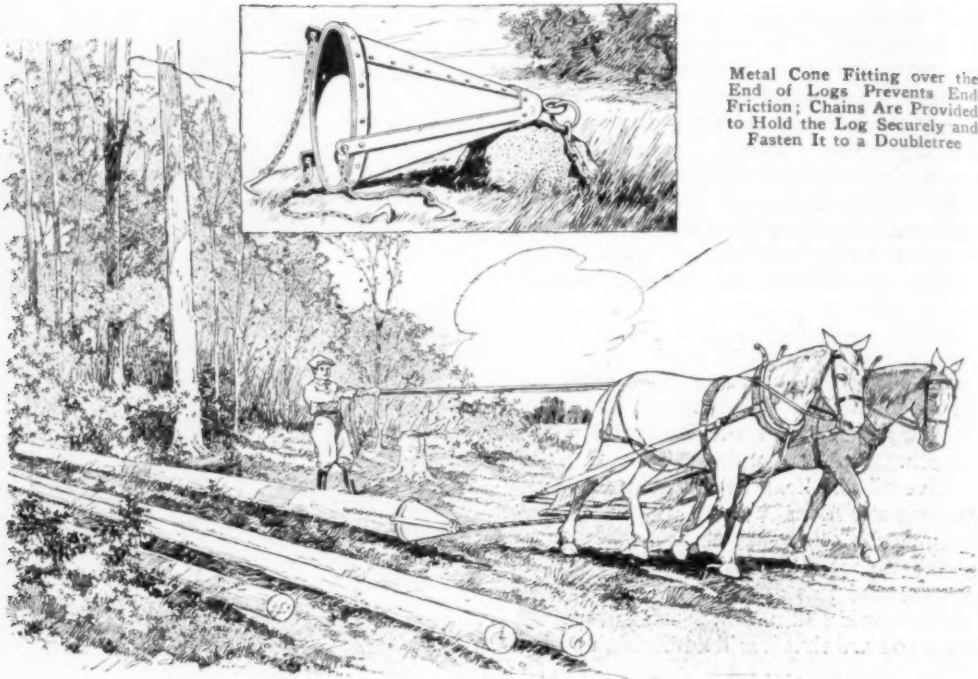


Handy Foundry Flask Made from Tire Rims

By burning the rubber off two old truck tire rims a very handy foundry flask can be made. Use one of the rims for the top, or cope, and the other for the bottom, or drag. A bracket and pin hold the cope and drag together. Pieces of pipe are used for handles.—Carlton Groat, The Dalles, Oreg.

Reversing Coil Points Aids Spark

After considerable use, the platinum points on an electric vibrating coil often become pitted and the spark will suffer in intensity and regularity. A good method of overcoming this trouble, temporarily at least, is to take out the screws holding the points in position over the core of the coil and reverse them. Take care to get the points exactly in line again and the proper distance apart to give the best and fattest spark. This simply reverses the current through the points and as the action differs, one pitting and the other building up a cone, the points will change their surface shape accordingly and tend to become more normal. Of course, when it can be done, they should be removed and filed smooth for best results.—L. B. Robbins, Harwich, Mass.



Metal Cone Fitting over the End of Logs Prevents End Friction; Chains Are Provided to Hold the Log Securely and Fasten It to a Doubletree

Metal Cone Facilitates Hauling of Logs

Made of sheet iron or steel, the cone shown in the drawing has been found handy for hauling telephone poles. The cone reduces end friction when the pole is dragged over the ground. The insert clearly shows its construction. Three chains are attached to the flat-iron frame of the cone, dogs being provided on the ends of the chains by means of which these are securely fastened to the log. A ring and chain are attached to the apex of the cone to permit a doubletree to be attached. This simple device carries the front end of the log over all obstructions and saves much time.—G. P. Melrose, Victoria, B. C.

Moisture-Proof Coating on Cellar Walls

In many locations it is impossible to drain off moisture on the outside of cellar walls to insure a dry basement. The next best remedy is to apply a waterproof coating on the wall. Melt 4 oz. of grease with 4 qt. of tar in an old pail or other container. While the grease and tar are being melted, thoroughly mix 2 lb. of pounded glass and 4 lb. of slaked lime, and then add this mixture to the former only in quantities

sufficient to cover a few square feet at a time. Apply the mixture with an old brush to a thickness of approximately $\frac{1}{8}$ in. This coating will waterproof the walls effectively, no matter how much moisture accumulates outside.

Stretching the Point

Lawyers are not the only ones who must often stretch the point. Mechanics frequently have to do it, too. On some repair work, the other day, my dividers were too small. I sharpened a short piece of wire on both ends, bending one of them at right angles.



I then forced the straight end through a cork, and stuck it on one point of my dividers, as shown. The extra point

was quite firm and rigid.—Frank W. Bentley, Jr., Missouri Valley, Iowa.

⚠ A metal chip from a cutting tool should never be pulled off with the bare hand.

Cheap Glass Stirring Rods

Glass makes the best material for chemical stirring rods, but such rods cost money and are easily broken. Good glass rods that cost nothing can be obtained as follows: Go to a paint shop or hardware store and ask for some narrow strips of glass. These can usually be had and are left-overs from cutting odd sizes of glass. They vary in width from $\frac{1}{2}$ to 2 or 3 in., and also in length. The sharp edges of the glass can be removed by means of a file so that there will not be any danger of cutting the hands.

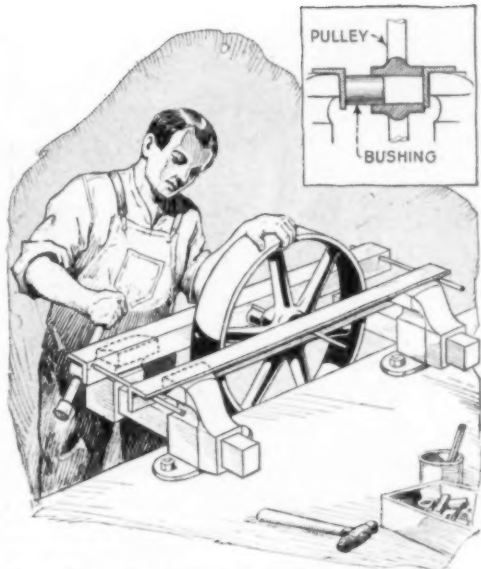
Removing Roller Bearings on Fords

Quite often it is necessary to remove a roller bearing so that felt washers may be inserted behind them to prevent grease from leaking out on the wheel. A simple tool for pulling out the bearing and the method of using it are shown in the drawing. It consists of an iron rod flattened at one end and bent to the shape shown. The flat end is slipped under the bearing, a length of iron rod is put through the eye and a block of wood is used as a fulcrum under one end of the rod while the other end is pulled, which immediately



Roller Bearings on Ford Axles Can Readily Be Removed with This Simple Tool

removes the bearing.—C. C. Stuart, Bridgeport, Conn.

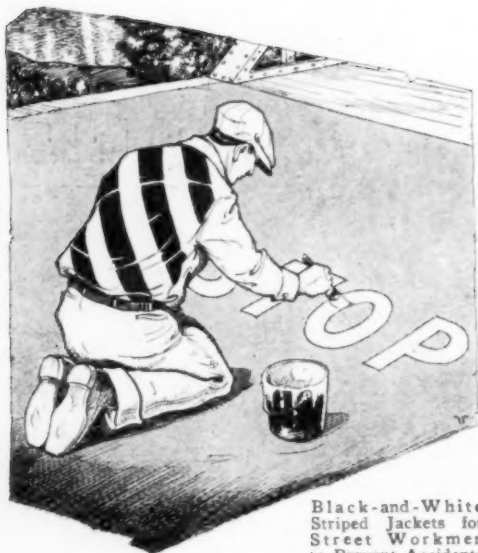


Using Two Vises and an Improvised Jig for Pressing Pulleys into Large Wheels

Double-Vise Press

If two vises are set close enough together, they can be used for much press work that could not ordinarily be done in a small shop. Most mechanics have found a vise a handy tool for pressing bushings into pulleys, but this can only be done when the pulley is small enough to allow the bushing to touch the vise jaw. For larger pulleys the two-vise method, shown in the drawing, can be used effectively. A length of angle iron is cut in two, clamped together and drilled in three places to take three rods. The end rods are to hold the angle irons in position when they are laid on the vise jaws and the central rod is to support the pulley while the bushing is being pressed into place. One man can operate this improvised press by opening the vise jaws first, then laying the angle irons on top and dropping the pulley, with the bushing started, between them, and inserting the pin to support it. The vise handles must be operated together.—Harry Moore, Montreal, Can.

Aluminum surfaces may be cleaned with a stiff-bristled brush and a solution of from 5 to 8 parts of water to 1 part of sulphuric acid; then a mixture of fine emery and turpentine should be applied vigorously with the same brush.



Black-and-White Striped Jackets for Street Workmen to Prevent Accidents

Striped Suits Insure Safety to Workmen

Shirts and jackets having broad black-and-white stripes have proved quite effective in preventing accidents to highway workmen. Clothes thus striped are more conspicuous than plain ones, and autoists, as a rule, immediately identify the wearer as a workman. This precaution is a good, cheap insurance and it is an easy matter to paint the stripes on the cloth. If this method is not desired, separate black and white stripes can be sewed on.—Harry E. Gifford, Medford, Mass.

Save the Drops

Little is known about the proper quantity of lubricating oil to be used in a steam engine. How many drops per minute are right? One drop may not be enough in your engine and ten may be too many. A good test to determine the correct amount of lubricant to use is a "flywheel test." While feeding, say, ten drops of oil per minute to the cylinders, just after a long run and while running at a normal speed, throw off the load from the engine. Then suddenly close the steam valve. The flywheels will cause the engine to continue to run for some time, and that is an important factor. How long does it take the flywheel to stop? By the use of your watch you can determine this to the second. Make a note of the time required

to stop from the instant the steam valve is closed until the engine stops entirely. Do it accurately. The next time try nine drops of oil per minute, but do not allow any other condition to be changed. If the stopping time is the same, you may as well save sixty drops an hour, 600 drops a day, or 180,000 drops a year. Then try eight drops, seven drops, six drops, etc. Finally, use the least number which permits maximum stopping time. Of course, judgment must be used when making this test. Do not choke down the lubricant until the cylinder is likely to be ruined. But as long as the stopping time is at its highest you may feel certain that the cylinder is well lubricated.

Wheelbarrow Fender

A builder noticed that the men pushing the wheelbarrows indoors had trouble in dodging around small pieces of wood that littered the floor. It was almost impossible to keep the floor clean as operations were going on continually and sawed-off blocks of wood were thrown down wherever the workers happened to be. It was thought the best thing that could be done would be to equip the barrows with some simple device to push the obstructions out of the way, and the fender shown in the drawing was found effective for this purpose. It is simply a piece of flat

metal, bent to the shape shown, and with both ends drilled to fit over the shaft at each side of

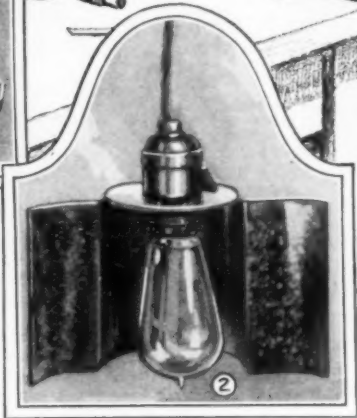
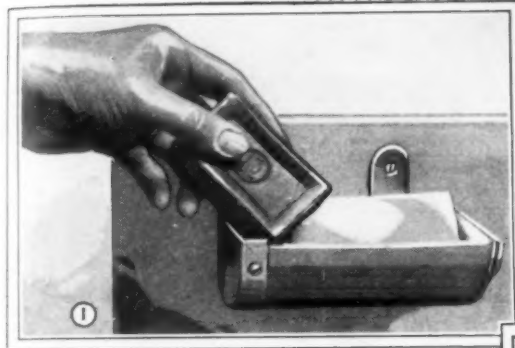
the wheel. When the barrow is needed outside of the building the fender is not used, but is laid back against the body. When it is used indoors, where the floor is level, it is dropped and



effectually pushes aside any obstruction of reasonable size, enabling the worker to go ahead in a straight path.

Tin-Can Mechanics

By L. R. ROBBINS



WHEN tin cans are emptied they are usually thrown away. However, a great many useful devices can be made from them, some of which are shown in the accompanying photos and illustrations. Persons living far from centers of trade, and from the cheap-price notion or variety stores, can turn tin cans into real value for the home. All that is necessary is a little patience and the knack of using a few simple tools. The photos show what has been done with tin cans to lighten kitchen labors, and these are only a few of the practical applications, as anyone can devise many more.

The tools necessary for the work are a good pair of small tin snips, a drill or a metal punch, a file, a pair of pliers and a small hammer. Use clean cans and provide a well-lighted bench to work on. It is a good idea to wear a pair of old kid gloves while working, to protect the hands from cuts and to keep them clean. To make the soap dish, shown in Fig. 1, get a can of medium size and one with a cover of the type used on baking-powder cans. Remove the cover and lay it aside. Then, with the snips, cut in a straight line up the side parallel to the seam, and continue the cut to the can bottom. Next cut

across the bottom along a center line and start up the side at the other end of the cut so that the can will be split about in half along its length. Two tabs are formed in making the last cut up the side. Cut the cover in half and fit the halves to the open ends with a few drops of solder, or by drilling or punching a couple of holes through the can edge and cover to permit riveting. Turn over all uneven edges with the pair of pliers, and hammer down or file off all sharp edges and corners. By giving the completed soap dish a couple of coats of bathtub enamel, or similar waterproof finish, it will make a fine article for the sink and will not rust as long as it is covered with paint or enamel. If placed over the sink, punch two or three holes in the bottom to allow water to drain out. If desired, the holder can be fastened to the wall with screws through the holes in the tabs.



A reflector for a droplight, as shown in Fig. 2, can be made in a very short time. Use a can with a shiny inside. Cans with mottled or enameled linings are not so good for this purpose. Mark a vertical line up the side opposite the seam. Cut along this line with the snips, as straight and evenly as possible, to the end of the can. Cut a round hole through the end just large enough to take the electric-light socket. If the fit is inaccurate, wind the ferrule with a turn or two of tape until the fit is snug. Next cut the sides of the can close to the end until points are reached on each side of the vertical cut about opposite each other. Bend these portions of the side back until they project outward like wings and crease the lines down the side of the can. The result is a semicircular reflector fronted by two wings. The bulb can be screwed into the socket and the light turned on. Such a reflector directs the light down onto the work and in front.

Soap shakers are always necessary in dishwashing, and a good one, shown in Fig 3, can be made from a small baking-

powder can and a length of galvanized-iron wire. Remove the cover and slip the can over a piece of round wood which will just fit inside. Using a spike, punch a number of holes through the can all around its circumference. Punch a single hole through the center of the bottom and the cover. Twist a handle from wire and arrange it so that the tines must be sprung out before they will engage in the holes in the ends of the can.

Cookie and doughnut cutters, as shown in Fig. 4, are also easy to make from can covers. For the former use a suitably sized cover with an even edge. No handle is needed. To make a doughnut cutter, it is only necessary to solder a small cover to the inside of a larger one, as indicated,

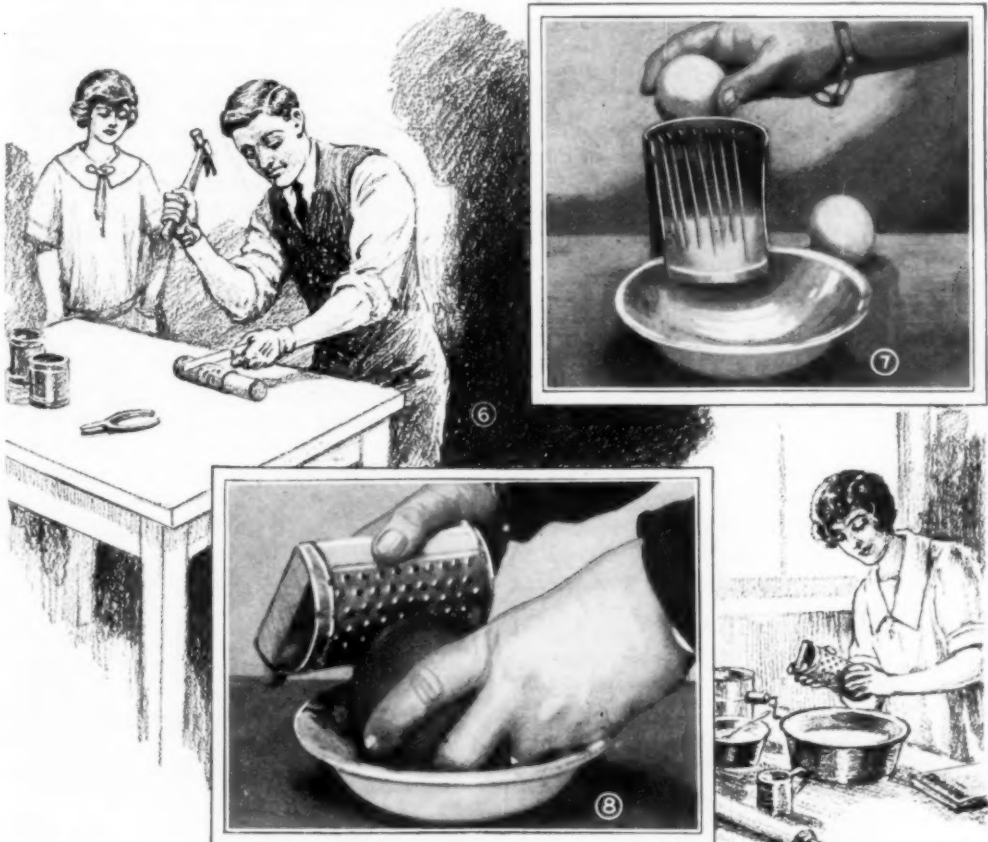
in the
edges
outfit
cover
using
need
cover
W
small
can
in I
heat
mak
abo
othe
aro
abo
ing
sta
left

in the center and so that the two cutting edges are even. If you have no soldering outfit, make a hole in the center of each cover and rivet or bolt the two together, using wood, paper or metal washers, if necessary, to hold the edges of the small cover even with those of the larger one.

When it comes to a double boiler for small quantities of material, two tin cans can be used to good advantage, as shown in Fig. 5. It is especially handy for heating glue, chemical mixtures, etc. To make one, get two water-tight cans, one about the size of an apple can and the other about half as large. Cut clear around the apple can with a can opener about halfway up from the bottom, leaving only a narrow section uncut. Then start from the two points where the opener left off and cut a narrow strip to the

edge of the can down toward the inside for the same reason. Fill this can half full of water and then place the smaller can, with the contents to be heated, inside of the larger one. Such an outfit can be made in fifteen minutes or less, and it will be worth making for emergency work.

To make a vegetable slicer, take a long, slender can, such as one in which some brands of round cookies are packed, and peel off the paper or burn off the enamel label. Place the can over a round stick that will fit snugly inside of it. Putting this on a bench, use an old knife blade and a hammer, as shown in Fig. 6, to cut a gash in the tin. Repeat this operation half a dozen times at various points, about 1 in. apart, on the same side of the can. Pry gently under one edge of each cut, to raise the adjacent tin up at a slight an-



top of the can for the handle. Bend this over as desired and wrap it with tape to prevent cutting the fingers. Turn the



gle to form cutters. To test the implement, pull a raw potato across the cutters, adjusting these until they peel the potato in long thin slices.

Good cake making often calls for an egg separator which is not always handy. One that does the work effectively is shown in Fig. 7. It consists of an empty tin can and a 3-ft. length of wire. The side of the can is cut down for about 3 in. and half the depth of the can. This free piece is flattened slightly by thumb pressure and is then bent out and down at the angle shown. The remaining portion of the top is laid on a block of hardwood and eight holes are punched through the rim just opposite the opened part. Eight 4-in. lengths of the wire are cut and hooked on one end. These are pushed through the holes from the back and allowed to rest on the slanting apron in front. If properly made, the wires will rest parallel and about $\frac{3}{8}$ in. apart. A dish is placed under the apron and an egg is broken and held over the wires. The white runs through to be caught in the bottom of the can, while the yolk runs down the wires into the dish.

A grater, shown in Fig. 8, can be quickly made by splitting a clean can in half lengthwise. Lay it, hollow side up, on a block of wood, and punch holes in it with a large, blunt-pointed spike. This forces a barb on the outside. Turn the edges in and nail it to a piece of wood fitted into the open side. By rubbing it briskly back and forth over the cheese, vegetable or

food to be grated, the job is done just as nicely as can be desired.

Now for a suggestion for opening tight-fitting tin cans: If the cover is driven on so that it cannot be twisted off, make a loose loop of soft wire just under the cover edge around the can, and place a large nail in the loop to twist the wire up tightly. This squeezes the can together, enabling the cover to be pried off without any trouble. The method of doing this is shown in Fig. 9.

Tin Foil for Packing Glands

Packing glands often stick tightly when close to the edge of the stuffing box, and



can be removed only by driving them out against the collar. However, owing to hardened oil and presence of scale, forcing the gland from one side often makes it stick more firmly. Several small nicks or grooves cut in

the collar, as shown, when a new gland is applied, make it possible to use a small

spanner to turn it a little before trying to get it out. Several half turns of a gland will invariably loosen it sufficiently to enable starting it easily. This also helps to keep the nut face of the collar true and even.

Keyhole-Saw Vise

Anyone can readily make a keyhole-saw vise for filing, in a short time, as follows: Get a block of wood, about 12 in. long and 2 in. high, and nail it to your bench, then saw a slot, about $\frac{3}{4}$ in. deep, in it. It will be found that the narrow blade of a keyhole saw can be inserted and held securely for filing without difficulty. The blade of the ordinary keyhole saw is just a trifle thicker than the blade of a standard crosscut saw, so that the groove will make a tight fit, preventing the keyhole saw from slipping out when the pressure of the file is on it.

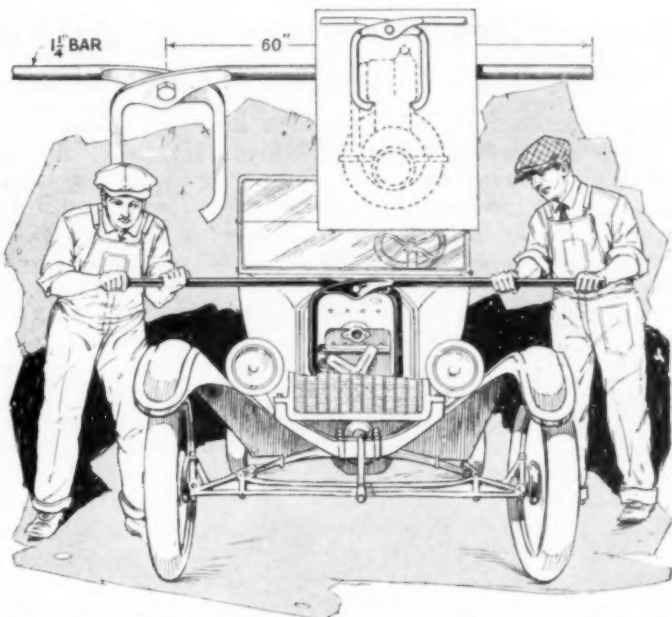
Scribing Circles with a Rule

You can scribe large circles very nicely with nothing but a 2-ft. rule. The wire dowel pin near the middle hinge makes a good pivot, so that it is only necessary to pinch the pencil between the 6-in. sections of the other half, as shown in the photo. This method is much better than a string,



Large Circles Can Be Scribed Accurately by Means of a Rule and a Pencil

for both the pencil and the point are rigid.
—F. W. Bentley, Jr., Missouri Valley, Ia.



Long Tongs Enable Two Workmen to Lift Automobile Motor from or onto the Chassis without Difficulty

Tongs for Removing Auto Motor

To remove auto motors quickly and with little trouble, one garage uses a pair of tongs with extension handles. The latter are 5 ft. long, to provide considerable leverage and to enable two or four workmen to take hold of them from opposite sides of the car, as shown in the illustration. The tongs are made of $\frac{1}{4}$ -in. bar stock, bent as indicated and forged flat at the point where they are pivoted together with a loose bolt. With the aid of these tongs the motor can be readily lifted from or returned to the chassis.—G. A. Luers, Washington, D. C.

Repair for Broken Spoke Tenon

It is not necessary to remove a spoke from a wheel because of a broken tenon. A repair can be made as follows: Wrap the end of the spoke evenly, for about 3 in., with fine wire. Drill a small hole in the end of the spoke and drive a 20-penny wire nail through the broken tenon and into the spoke. A coat of paint will make the repair practically invisible. If the spoke is to be repaired without removing the tire, drill a hole through the tire for the nail, countersinking it for the head.

How to Care for Balloon Tires

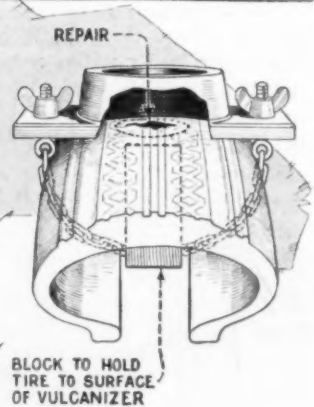
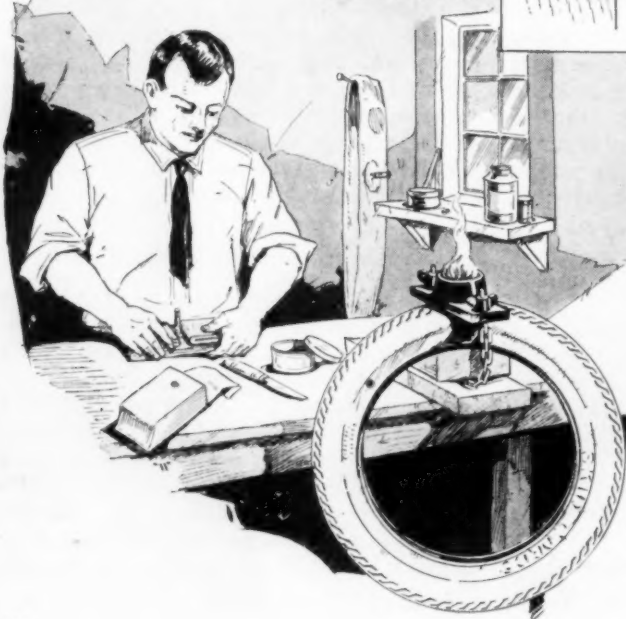
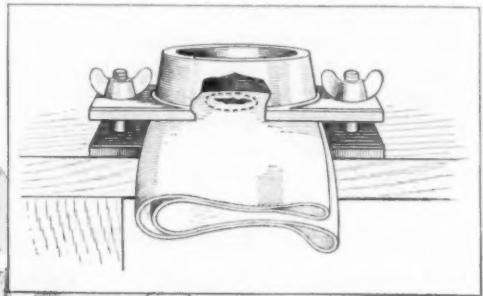
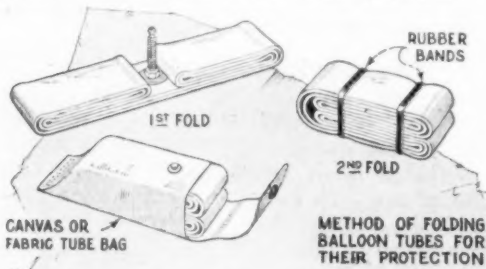
By G. A. LUERS

THE facility with which balloon tires ride over cobble stones, broken macadam or concrete, and their cushioning effect, which protects the car and gives comfort to the passengers, must necessarily be accounted for either by additional tire expense or by extra care in order to obtain maximum mileage from this type of tire with its relatively thin walls.

The inner tube of a balloon tire has more than double the wall area of the high-pressure type of tube. It is essential that every precaution be taken to protect the tube, as any hole in the wall will deflate it and may then ruin the casing in a short time. A spare balloon tube should be carried in a bag of heavy duck or waterproof canvas. This will prevent chafing from contact with tools. The procedure

of rolling the tube is to deflate it by removing the valve and flattening the tube, with the valve in the center and held up as shown in the upper left-hand detail of the illustration. It is folded into a rectangular bundle, which is held together securely by means of one or more rubber bands, after which it is slipped into the tube bag. Talcum powder or soapstone should be applied liberally before closing the bag.

In case of a flat tire it is essential that the tire be changed immediately, as the thin wall of the casing and the tube will soon be cut and bruised beyond repair. Therefore, do not drive on a flat balloon tire. The use of a cold patch on a balloon tube is not advisable, as the flexibility of the tire will allow it to work



Proper Methods of Folding Tubes, and Vulcanizing Tubes and Tires of the Balloon Type on Ordinary Vulcanizing Equipment, to Keep the Tires in Good Condition

lose, causing the tube to leak slowly, and a soft tube may endanger the casing before the leak is discovered. For this reason leaky tubes should always be vulcanized. It will be found that a balloon tube is too wide to fit into the usual type of vulcanizer. To accommodate the tube to the vulcanizer it is possible to fold it once, making four layers of the wall, and the patch can then be vulcanized in the usual way, as shown in the upper right-hand detail.

Due to the relatively small number of layers of fabric in the casing of balloon tires, it is necessary to protect them against the entrance of water and grit through small cuts. A heavier tire wall, with the reinforcement of numerous layers of fabric, will withstand considerable usage before blowing when the rubber is cut, but a balloon tire has a weak side wall and fractures in the rubber must be repaired immediately to prevent the fabric from weakening. Also, in this case, the usual vulcanizer, possessed by many auto owners, does not readily lend itself for use on balloon tires. However, to use it for this purpose, the casing must be made to fit the curvature of the vulcanizer. This can be done by inserting a small convex block inside of the casing while clamping the vulcanizer over it on the outside. This method will push the patch into contact with the vulcanizer and permit it to be used effectively. Too much emphasis cannot be placed on the necessity of making vulcanized repairs to breaks in balloon tires and tubes.

The pressure for balloon tires varies from 25 to 40 lb., depending on the make of tire used. This information is given the buyer at the time of purchase, and is often printed on a sticker attached to the windshield of a new car. Although high-pressure tires will stand up when inflated 10 or 15 lb. below their required pressure, a drop of 5 lb. is the limit for most balloon tires. To safeguard against the deflation limit, weekly inspection and replenishment of air should be made. An air gauge specially made for balloon tires should be used in order to get accurate readings.

Many chains available for balloon tires are similar to those used on trucks. Obviously, such heavy chains are really unsuitable for passenger cars. When buy-

ing tire chains, the purchaser should assure himself that he is obtaining the chain made especially for balloon tires.

Electric Fan Helps Sell Goggles

In a Los Angeles motorcycle shop, an electric fan on the accessory counter has



Testing Goggles or Driving Glasses in Front of an Electric Fan

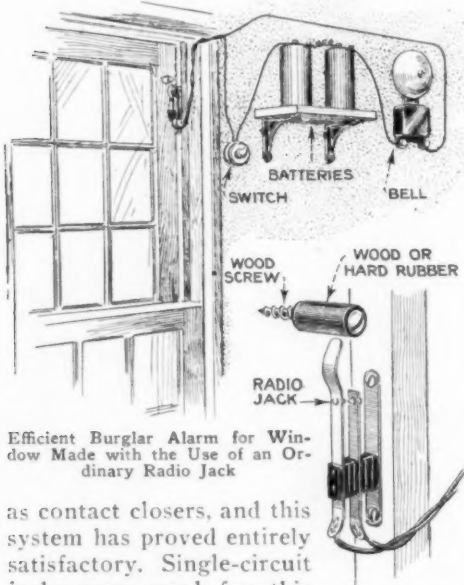
been found a valuable adjunct to the sale of goggles and driving glasses. The prospective purchaser when trying to determine whether or not the goggles or driving glasses offer him the protection desired, is asked to step in front of a fan, which is then turned on. With his face in front of the fan, the customer decides whether the goggles fit.

Leather Piston Packing

A service pump in a street-railroad power plant gave considerable trouble by water slipping past the plunger. The engineer could find no remedy until he tried six ordinary leather packing rings, which easily fitted in the water cylinder when dry. These were placed on the piston just as ordinary packing, and the follower plate and nut put in position. Since using this packing the pump will often run eighteen months without attention.

Burglar Alarm for Windows

Recently I installed a burglar-alarm system in a small shop, using radio jacks



Efficient Burglar Alarm for Window Made with the Use of an Ordinary Radio Jack

as contact closers, and this system has proved entirely satisfactory. Single-circuit radio jacks were used for this purpose. No change was made in them except to flatten the bent blade slightly, as shown, and to cut off part of the frame, the remaining part being drilled for wood screws with which the jack was securely fastened to the upper sash. A 1-in. length of $\frac{1}{2}$ -in. dowel stock, hard-rubber or bakelite rod, with a hole drilled through the center, was used in conjunction with the jack, being so installed that when the window was opened, the round rod would press the outer blade of the jack against the inner contact, closing a circuit and causing a bell to ring. If the lower sash is not permanently fastened, a jack should also be installed on it as well as on the upper sash. The same type of circuit closer can be used on a door, the round rod projecting from the door and the jack being placed against the wall.—Herman R. Wallin, Brooklyn, N. Y.

Belting Horizontal to Vertical Pulleys

Quarter-turn belts connecting horizontal with vertical shafts often give trouble. The belt on the vertical pulley is attracted by gravity and does not stay up where it belongs. This difficulty can usu-

ally be overcome by employing a vertical pulley having more than ordinary crown. It is not always necessary to use an idler pulley on drives of this sort. If possible, it is best to avoid the use of idlers because they consume power and cause wear. Another thing to bear in mind is to use as light a belt as possible. Where the distance between pulleys is so great that the weight of the belt causes it to leave the vertical pulley regardless of the crown, it is best to use a guide pulley. Some belt men use two guide pulleys, but unless the distance between transmission pulleys is unusually great, only one guide pulley should be used. It should support the side of the belt going onto the pulley, on the vertical shaft. The side of the belt leaving that pulley does not need support. Where distances between pulleys are exceedingly great on quarter-turn drives of this kind, the problem is sometimes solved by shifting the pulley on the vertical shaft up or down, as the case may be, until a position is located which holds the belt centrally at all times.—W. F. Schaphorst, Newark, N. J.

Improved Depth Gauge

When drilling a number of holes to a certain depth with a wood auger, a depth gauge is necessary. If one is not available, take a block of wood, 1 to $1\frac{1}{2}$ in. square and as long as the distance from the tip of the auger to the chuck. Drill a hole lengthwise through the center of the block and cut off a section equal to the depth of the hole desired. Slip the block over the auger and push it tightly against the chuck. The size of the hole in the block should be the same as the size of the auger so that it fits tightly.



❑ Uneven heat in tempering causes irregular strain and cracks in tools.

Oversize Printers' Rollers

Rollers for presses are cast larger than the bearing rollers at the ends, and as a result the rollers jump when passing onto the type forms. This is especially troublesome with small forms as it not only fills the type with ink but is wearing on the rollers. The usual remedy is to lock up type-high roller bearers in each end of the chase. The bearers will take the ink and smear it on each end of the drawsheet where one is likely to get his fingers into it. A better method is to get one or more strips of felt and fasten them with glue to the roller guides at each end of the press. This raises the rollers so that they pass over even single-line card-job forms smoothly. The felt will wear for months in the ordinary small-town job shop before replacement is necessary.

Guard for Gas-Tank Filling Pipe

Gas-tank filling pipes that extend above the ground at auto-service stations usually come up through well-sodded ground. However, as gasoline is ruinous to grass, if spilled on it, which usually happens when the tank is being filled, one station owner placed an old auto rim around the pipe, and filled the space inside with gravel. The rim was painted to give it a neat appearance. If any gasoline spills, it falls on the gravel, where it evaporates without hurting the sod outside the rim.

—Dale R. Van Horn, Lincoln, Nebr.

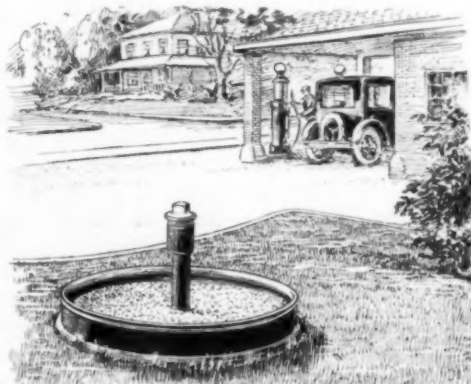


Handy Wooden Chute Conveys Parcels from Second-Floor Shipping Room to a Loading Platform Below.

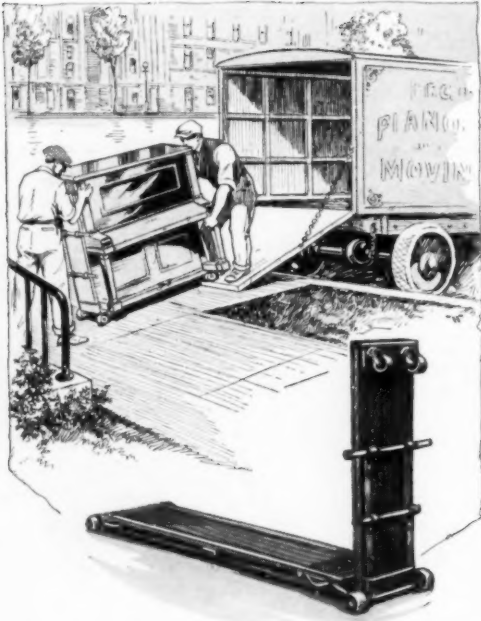
Chute for Parcels

Shipping departments located on the second floor will find this method of handling wrapped parcels of great value to them, inasmuch as it saves labor and floor space. A window, facing the alley or street where loading takes place, is boarded up in the manner shown in the illustration, and an inclined chute, made of 1-in. lumber, is run from the window

to the loading platform or bin into which the parcels slide. Ordinary large furnace piping can be used instead of 1-in. lumber, if care is taken when assembling it. The lower end of each section of pipe is slipped into the upper section of the length below it, so that there will be no edges for the parcels to catch on.



Old Auto Rim and Gravel Filling around Pipe of Gas Tank Protect the Grass



Two-Sided Dolly Which Is Handy for Moving Pianos and Similar Heavy Objects

Dolly Facilitates Piano Moving

Moving pianos and similar articles is hard work at the best, but here is an improved dolly which will make the task much easier. It is really two dollies combined, at right angles to each other. Both parts are equipped with casters, the two on one end being of the bed-post variety. The piano is strapped on the dolly and left there until the destination is reached, making it easy to handle at any time.—Jos. C. Coyle, Denver, Colo.

Repair for Galvanized Tanks

It became necessary for us to have additional tank space but we did not feel justified to purchase a new tank. We found an old tank on the junk pile. The seams had opened and rust had eaten through the bottom at a dozen places. We gave it a thorough washing out and then applied a coating of ordinary street asphalt. For the seams and holes along the sides, we applied the asphalt in the same manner as solder, melting it with a blow-torch just enough so that it would roll out into a strip, wedging this into place and then flowing it with the flame. We spread

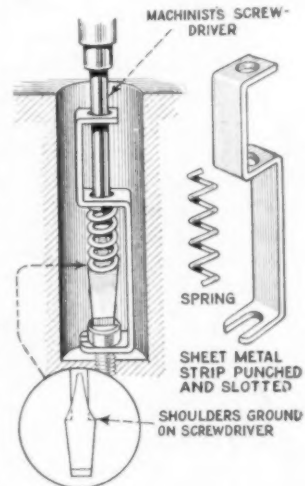
a thin layer all over the bottom of the tank, and a thicker layer around the seams at the edges. Then we poured in the water, which caused the asphalt to set almost instantly. We intended this simply for a temporary job, but the tank has not shown a leak after two years of service. The asphalt in the bottom, where it is always covered with water, never softens. In very hot weather, the patches along the sides soften until the asphalt gets pliable like rubber, but it has never run. Recently we cleaned out our good tank and also spread a thin layer of asphalt over the bottom to prevent it from rusting.—Ralph W. McPherson, Wahoo, Nebr.

Screwdriver Attachment Holds Screws Securely

Various methods have been adopted for holding screws securely to a screwdriver, and the one shown in the accompanying drawing has been found particularly useful for holding screws in deep recesses. It also enables one to remove a screw from such a place without any danger of the screw falling down into the machinery or other place where it is not wanted. The screw-holding device can be made by anyone and consists of a length of flat iron, bent to the shape shown, and a small coil spring. The only change made in the screwdriver is that the

shoulders are ground on the blade, as indicated in the lower detail. The attachment is applicable to either large or small screwdrivers

and can be used with wood or with machine screws. It is obvious that the width of the slot or recess in which the tool is used must be such that the screwdriver can be moved sidewise enough to disengage from the screw, after starting this.



Noiseless Wagon

By using both front and rear axles and wheels of a discarded auto, an easy-riding

the slot of a pin driven in the tool. A small pin through both parts completes the assembly. In operation, the diamond-pointed tool enters the slot made by the parting



Using Discarded Auto Wheels and Axles on a Wagon Makes It Easy-Riding and Noiseless

and noiseless wagon can be made. Such old auto parts can usually be purchased much cheaper than wagon wheels.—Carlton Groat, Portland, Oreg.

Automatic Chamfering Attachment on Parting Tool

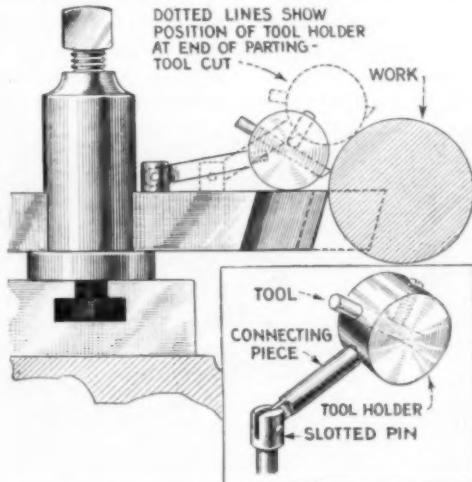
Many lathe and screw-machine operators use a file or a hand tool to break the corners of the slot made by a parting tool. In the absence of a double toolpost, the parting tool can be fitted with a chamfering tool, which can be adjusted to suit the work and will thereafter automatically perform its task without further attention on any brass-rod work. First of all, cut off a piece of round steel for a tool-holder. Drill this through the center to take the tool, tap it for a tightening screw and tap it again for the connecting piece, which is flattened at the other end to fit in

tool and breaks the corners. As the parting tool is fed further in, the round tool holder strikes the work, causing the holder to ride up the work and permitting the parting tool to complete the cutting off. When the parting tool is withdrawn, the attachment drops down ready for the next cut.

Insuring Proper Chimney Draft

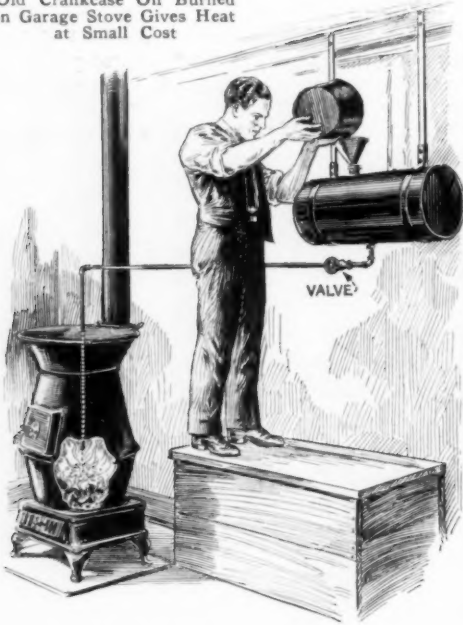
Down draft and "choking" in a chimney often occur when the chimney top does not rise higher than the peak of the roof.

This is especially true when the chimney is an outside one and comes up alongside the house. The smoke is cut off and is held up in the chimney. To overcome this difficulty the chimney should be three feet above a horizontal line from the peak of the roof. Often a group of trees stand close to the house, the tops rising above the top of the chimney, and the same trouble may occur.



Automatic Chamfering Attachment on the Parting Tool, Useful in Absence of Double Toolpost

Old Crankcase Oil Burned
in Garage Stove Gives Heat
at Small Cost



Burning Crankcase Oil in Stove

Most garages have a large quantity of old crankcase and other waste oil. This is usually thrown away, but it can be used as fuel in a common stove or furnace by means of the simple arrangement shown in the drawing. A tank of 5 or 10-gal. capacity should be suspended above the stove, but a safe distance from it. An old auto gasoline tank will serve the purpose well. A $\frac{1}{2}$ -in. pipe is tapped in the bottom of the tank and run to the stove, as indicated. The pipe should project inside of the stove at least 8 in. and a valve is provided in the pipe line to regulate the flow of oil. When all connections have been made, the line and tank must be thoroughly tested for leaks. After the apparatus has been completed, the tank is filled with oil and a fire is built in the stove. The firepot should be well filled with fuel so that the dripping oil will not get into the ash

pan before it is burned. When the fire is burning well, open the oil valve gradually so that the oil will slowly drop into the fire. A small amount of oil will keep the stove burning all day. In order to safeguard the oil tank against fire while filling it, a heavy felt washer should be placed around the pipe just under the tank to absorb any overflow oil, which might follow the line to the stove. A stove burning oil in this way has saved one garage owner about 80 per cent of fuel otherwise required during the season.—S. A. Marshall, Jr., Rome, Ga.

Grease Nipples for Large Grease Cups

When grease nipples for pressure grease guns are being fitted to machines, it is not always desirable to discard the large grease cups, which may be turned frequently with the fingers. A practice in one shop is to fit the cap of the grease cup with a grease nipple, and to fill it with the grease gun. This involves only drilling and tapping for $\frac{3}{8}$ -in. pipe thread. Apart from provision for making half turns or more of the cover between the intervals of grease-gun lubrication, the large supply of grease will feed at any time when the bearing becomes heated enough to make the grease flow.—G. A. Luers, Washington, D. C.

Novel Seat for Filling Stations

Many filling stations have a guardrail along the drive, consisting of a gas pipe run through 4 by 4-in. posts, set in the ground at 6-ft. intervals. If desired, a seat can be made by simply cutting square holes in a 2 by 12-ft. plank, to fit snugly over the posts, and nailing cleats to the underside of the plank on each side of the posts. The seat thus made is rigid, permanent and just the right height for most people to sit on it comfortably.—Dale R. Van Horn, Lincoln, Nebr.



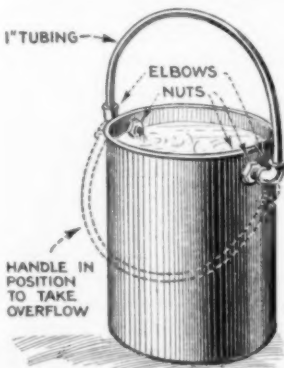
Simple Seat on Filling-Station Guardrail Can Be Made from a Plank

Color Holders for Decorators

When doing stenciling and line work on walls and ceilings, it is necessary to have several colors at hand. To have these handy, it is best to arrange a sufficient number of tin cans on a stout cord or small rope, tying it as a belt around the waist. Holes are made in the tops of the cans to admit the cord or rope. This will save a great deal of stooping.

Non-Overflow Bucket

The type of bucket shown in the drawing was constructed to stop continual splashing on the floor of a manufacturing concern. The buckets are used to clean the chips out of drill jigs after each operation. They are filled with a soda solution, and, formerly, when an operator dropped a jig carelessly into the bucket, or dipped one when the bucket was almost full, the contents would overflow on the floor, making it slippery. To prevent this, a hollow handle was provided to take care of the overflow. It was made of 1-in. tubing bent to a semi-circular shape, as shown, and the ends fitted into elbows, which are threaded into short nipples passing through holes in the bucket. The nipples are tightened with locknuts on each side so that the handle works on the threads of the nipples.



ing. Lifting the handle causes the overflow to run back into the pail.—Harry Moore, Montreal, Can.



Simple Lean-To Scaffold Is Easy to Erect and Takes Little Space in the Workman's Truck

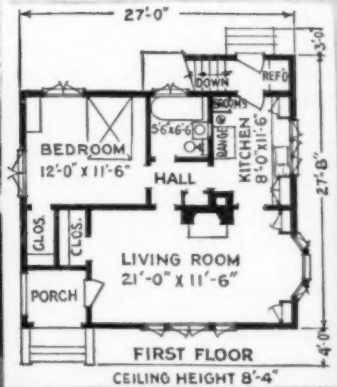
Scaffold for Painting

For working at certain heights on the outside of buildings, as for instance when painting window sashes, the simple scaffold shown in the photo will be found to be of considerable utility. It consists of two supports, each of which has a 3-ft. horizontal member, a forked leg and suitable braces for holding the two members together securely. The end of each support is set against the wall of the building and a plank is laid across them. This scaffold takes little space in the truck and is therefore easy to transport, a feature which is especially appealing to the workman. It is, of course, necessary to set the legs squarely on the ground or the scaffold may collapse when the workman gets on it. The legs should not be set on smooth surfaces where they are likely to slip.—Edward A. Weatherston, Chicago.

Is This Your Home?



Copyright, Architects' Small House Service Bureau



Plan No. 3A7

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 you 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.

IF three rooms meet the needs of your family, why build more? For the young couple just starting their married life, a three-room cottage supplies almost all that is required. For the old folks, going on after children have left home, three rooms provide comfort, conveniences and light responsibilities as to housekeeping.

The popularity of this type of home seems unquestionable, if one may judge from the multitude of these which fringe all our cities. Unfortunately many of the houses thus seen have no architectural character, and yet there is no reason why they cannot be just as attractive as the larger houses. The fundamental principles of good architecture, which are fine appearances, good plan, and sound construction, apply just as well to small houses as to larger ones. In this design the architect has made use of the simple element of wall openings and roof to get balance, and construction is simplicity itself.

The house is of frame construction with an exterior of stucco. It is equipped with casement windows. A hooded porchway

under the main roof leads to the living room. One of the end walls is made a bit more decorative by including an oriole window. There is a trellis at the side of the door, upon which vines may be trained.

The plan could hardly be improved upon. A special feature is the living room. This is entered from the porch, and along one side of it is a large window with four casements. Along the end is the oriole window with built-in cupboards at either side. On the inside wall is the fireplace. At the other end is placed a huge coat closet. At the rear of the house are arranged, in order, kitchen, bathroom and bedroom, with a hallway connecting them all and a linen closet in the hall.

This house might very well be built without a basement and heated by one of the several specially designed heating systems that have been devised for small houses. Even though it is a small house, the rooms are of unusually good size. The closets are deep and commodious. If extra sleeping space is desired, a bed can be installed in the closet off the living room.