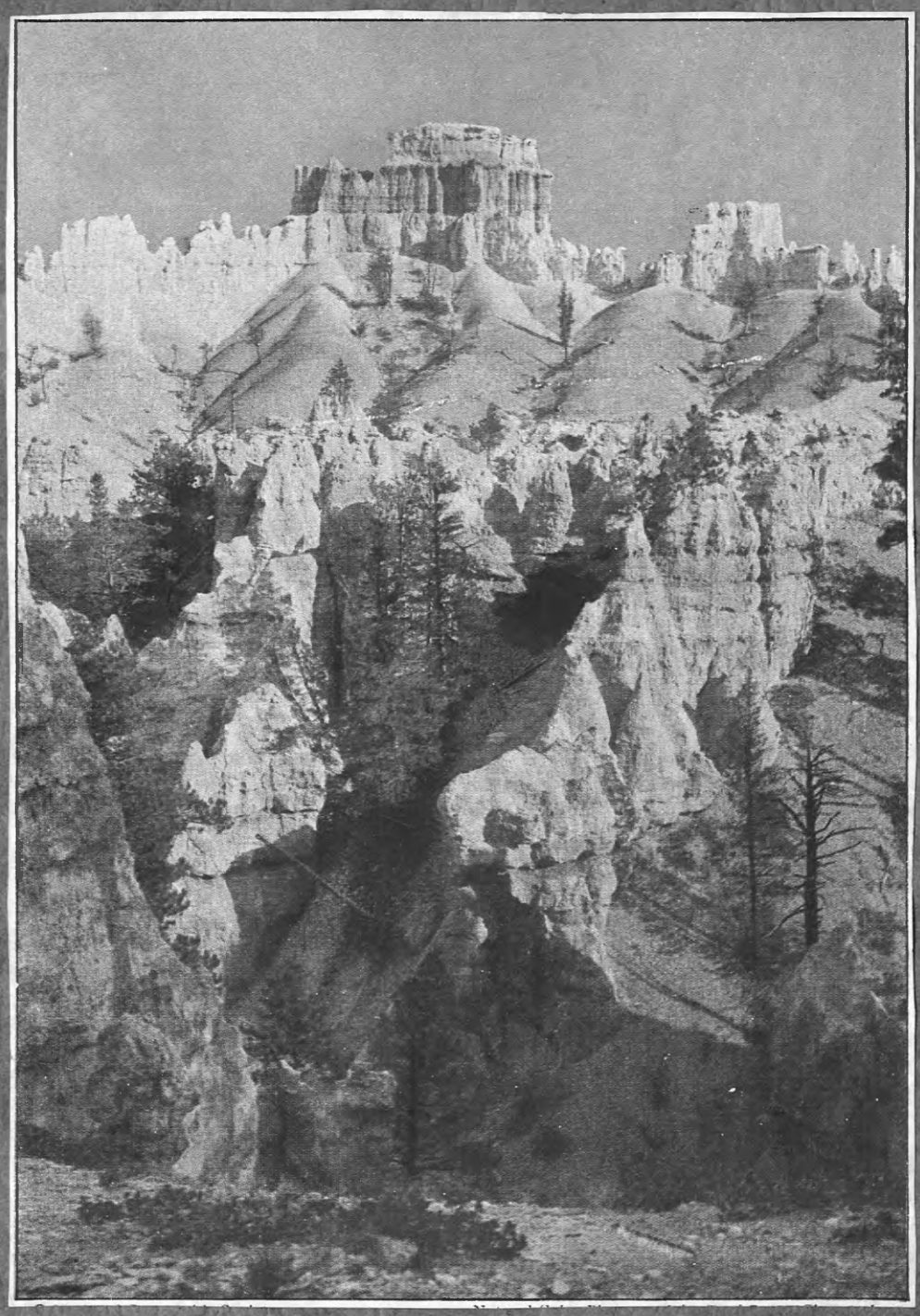


NATURAL SCIENCE

Gordon Shumard

Natural Science

BY A-

Gordon Shumard
8B-5.

Part I

Contents

Part I

Lesson I

Lesson II

Part II

Key Words

Air pressure - The weight of air.
Aneroid - A kind of thermometer without mercury and alcohol.
Atmosphere - The ocean of air above the earth.
Centigrade - The thermometer with boiling point at 100° and freezing 0°.
Cyclone - Force or great force of wind traveling straight
Fahrenheit - The thermometer with boiling point at 212° and freezing 32°.
Fog - A proof that there is moisture in the air.
Humidity - Air moisture
Hygrometer - An instrument used to test air.
Pascal - A great scientist that proved Torricelli's theory a part.
Relative Humidity - The amount moisture in the air that is needed.
Saturated - To become penetrated until no more can be taken up.
Temperature - The amount of heat in the air.
thermometer - An article used to tell the degree of heat.
Tornado - A twisting like funnel shaped object that pull up and destroys

Key Word (cont.)

Velocity – The force of wind.
Wind – Air in motion.

Key Sentences.

1. Local storms include electric (thunder) storms, rain, sleet, snow, hail, and wind storms.
2. A general storm area includes the air conditions over a large extent of territory. General storm areas move along rather definite paths across country.
3. Weather conditions in a general storm area or cyclone are rather constant as the storm moves along.
4. Thundershowers (electric showers) are caused by sudden and rapidly rising currents of warm, moist air.
5. Lighting is an electric discharge between adjacent clouds or between a cloud and the earth.
6. Properly installed lighting rods on buildings are a protection against lighting.
7. In a cyclone area the air moves counter-clockwise in the northern hemisphere and clockwise in the southern.
8. A hot wave in the northern section of the country occurs in summer when the corresponding "high" separates from its "low" and spreads over the southern portion. This causes the "low" to move slowly across the northern part.
9. A cold wave occurs in winter when conditions of the hot wave are reversed.
10. Climate is the average of weather conditions for a particular area over a long period of time.

Key Words.

Cold wave – A cold wave occurs according to the air pressure.

Conductor – An article through which electricity may pass.

Cyclone – A straight wind that blows with a great force.

Electric charge – Voltage.

Lightning – An electric discharge.

Negative – Push.

Positive – Pull.

Potential – Electric charges measured in volts.

Thunder – An explosion that is made by cold air rushing in a warm air.

Key Sentences

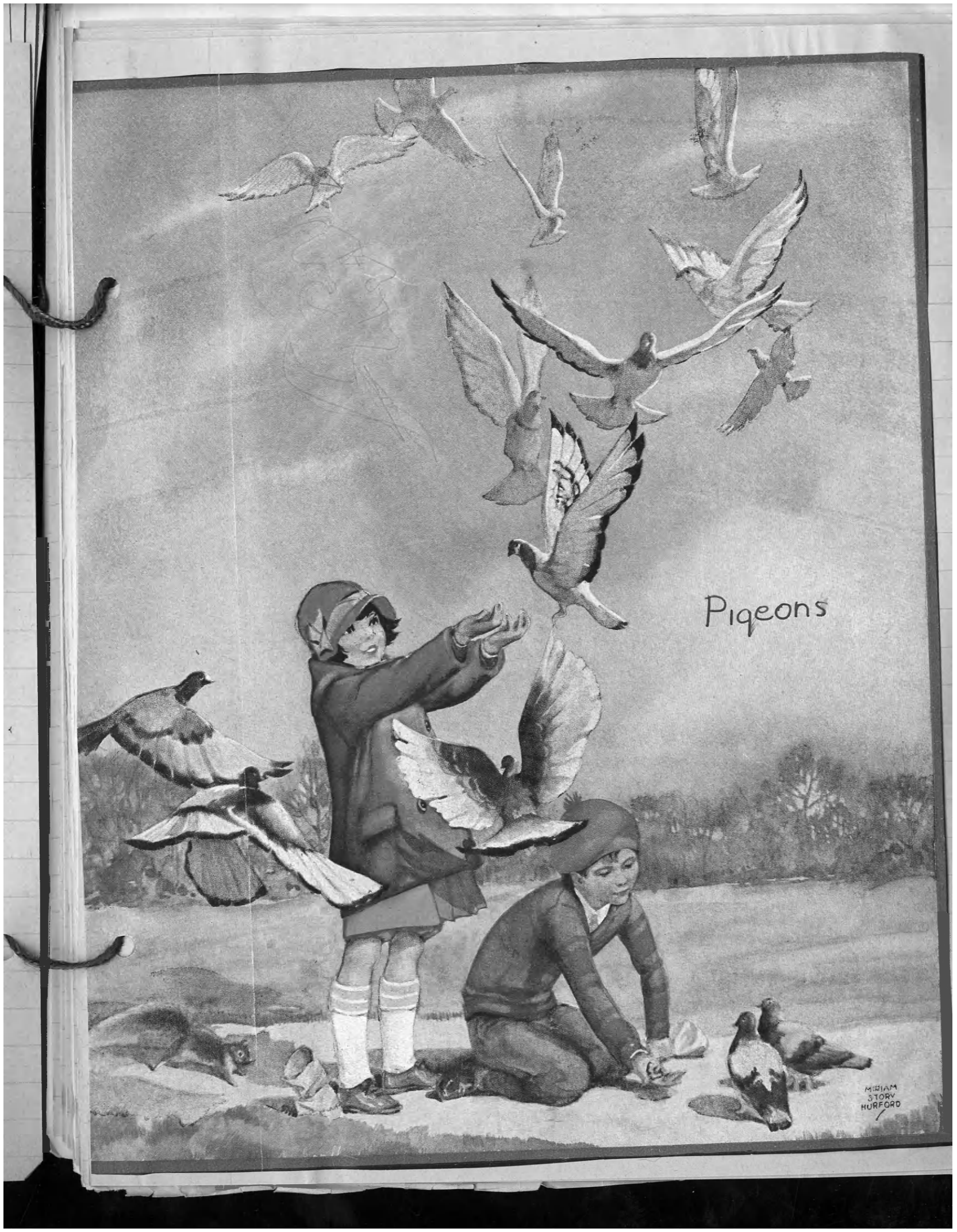
1. The Fahrenheit thermometer scale has 32° for the temperature of freezing water (or melting ice) and 212° for the boiling point of water at sea level air pressure.
2. The Centigrade thermometer scale has 0° for the temperature of freezing water (or melting ice) and 100° for the boiling point of water at sea level air pressure.
3. Air pressure (atmospheric pressure) is due to the weight of the air.
4. The air pressure decreases as the altitude increases.
5. Air pressure can be measured with a barometer.
6. Wind is caused by the unequal heating of the air.
7. Due to the rotation of the earth, air currents are deflected to the right in the northern hemisphere and to the left in the southern hemisphere.
8. Air moves in great whirls called cyclones.
9. The pressure of the wind increases as the square of its velocity.
10. Relative humidity is the ratio of the amount of moisture in the air to the amount that would be needed to saturate the air at a given temperature.

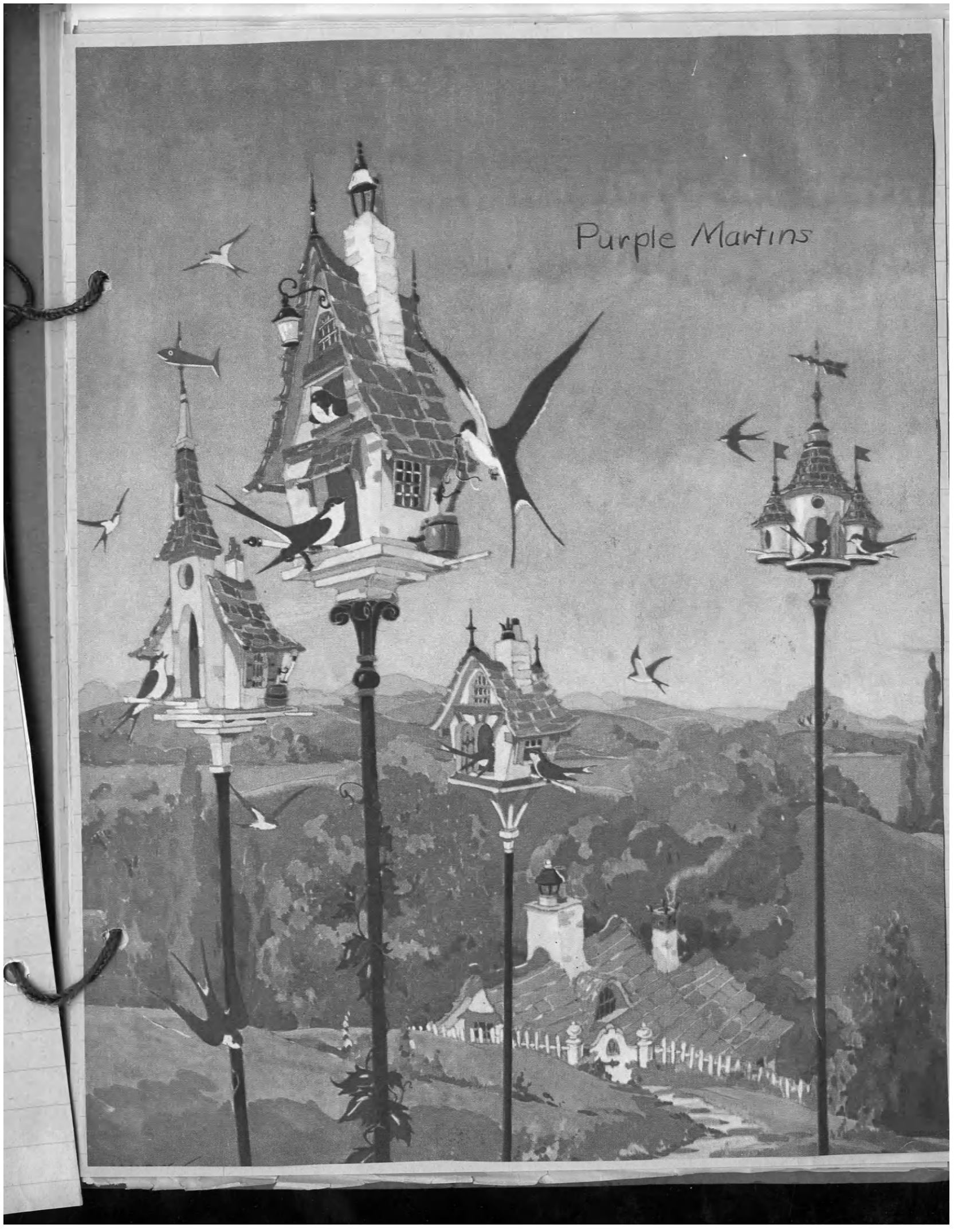
Birds

I

Have

Seen


Pigeons
MIRIAM
STORY
HURFORD


Purple Martins


House Wren

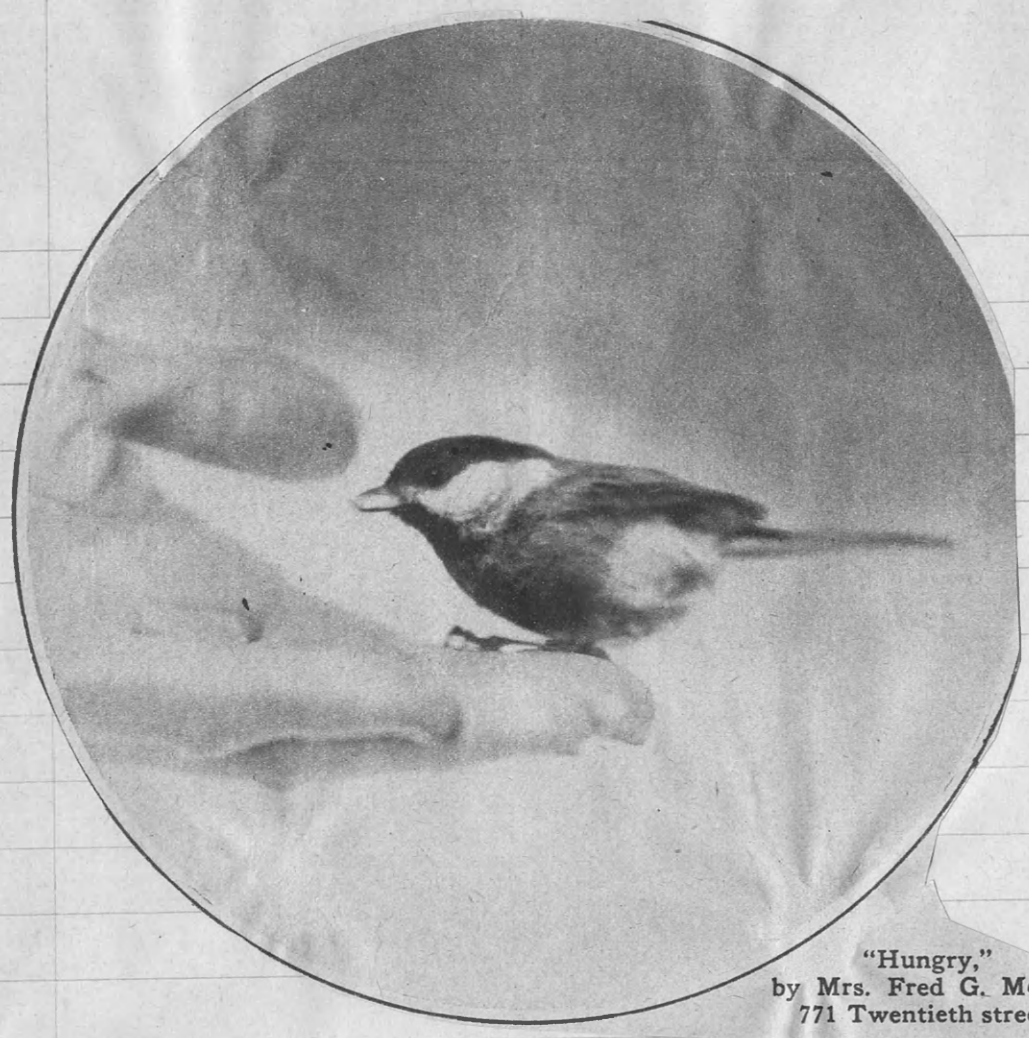

American Three-toed Woodpecker


Red-winged Blackbird

Bluebird.

THE WISDOM OF THE OWL

This bird is credited with the qualities of a veritable Solomon.



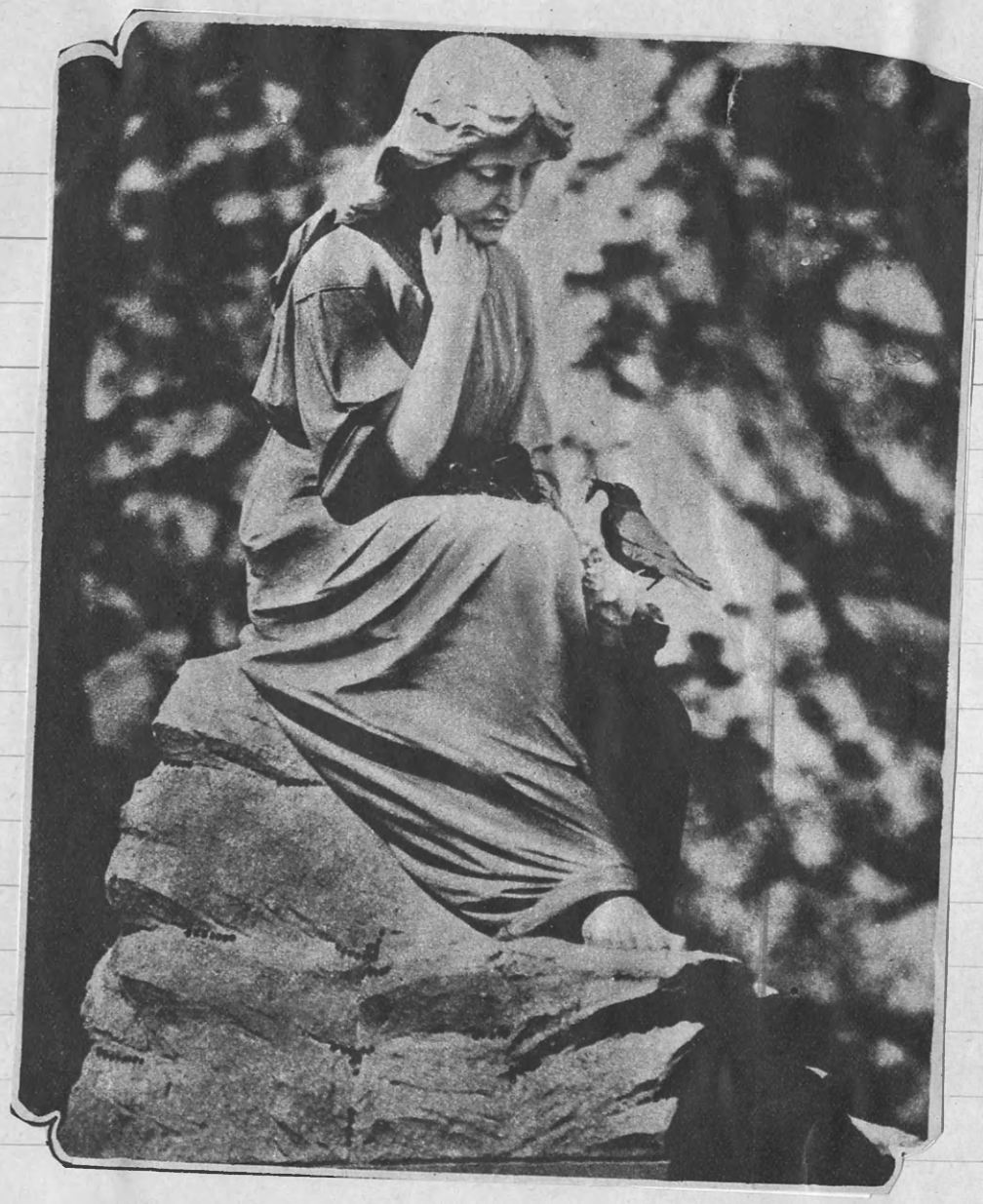
"Hungry,"
by Mrs. Fred G. Meyer,
771 Twentieth street.

House
Wrens

BOB WHITE HIMSELF

The American Eagle

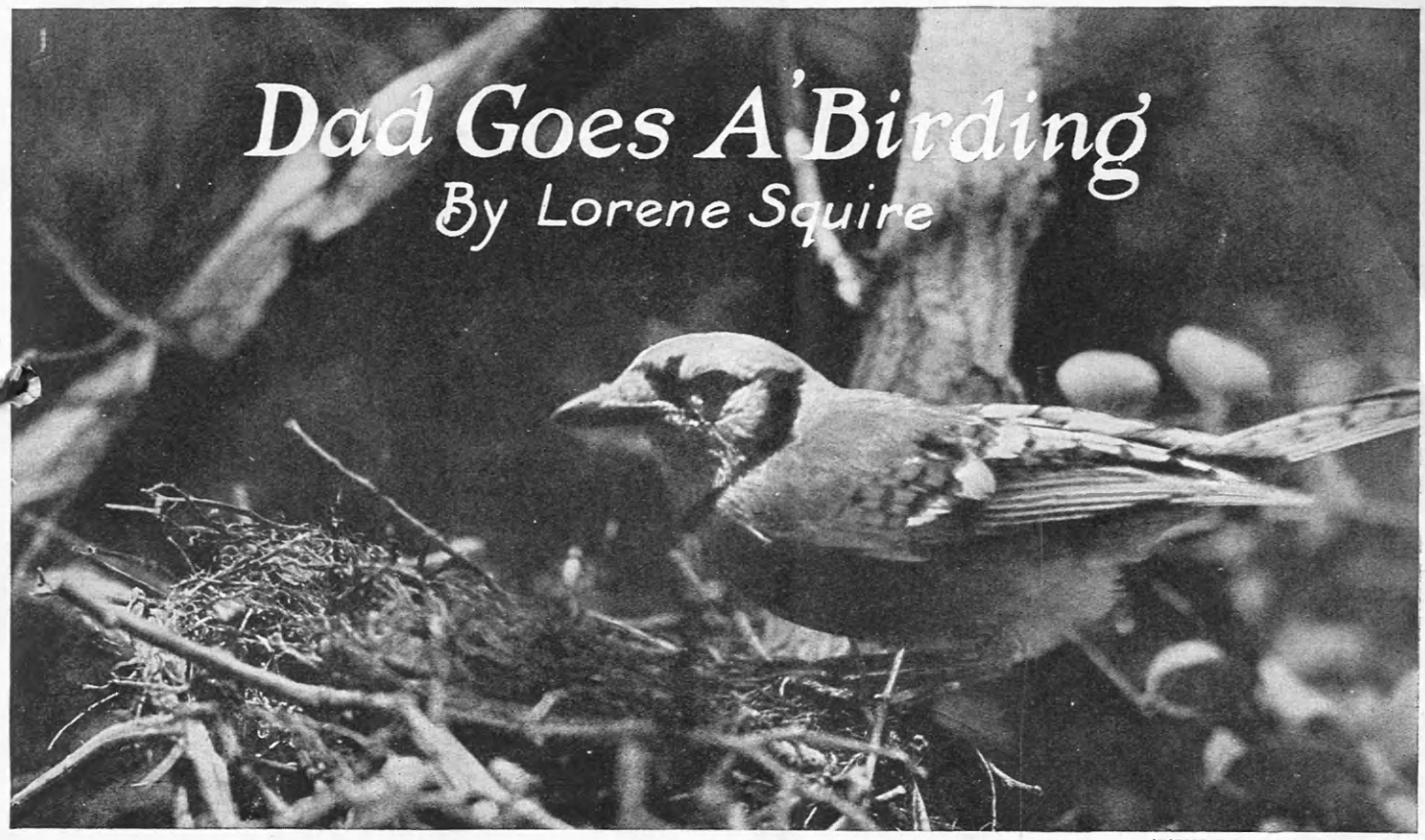
of the material for the building of this over it as readily as though it were a piece of spaghetti.



A Robin.

Dad Goes A'Birding

By Lorene Squire



PHOTOGRAPHS BY THE AUTHOR—AND DAD

THE BLUEJAYS WERE PARTICULARLY PESTIFEROUS

Dad thought they should be easy to photograph because they were so bold, but he found out otherwise.

"I'M NOT going to play golf tomorrow," announced Dad from behind his newspaper. "How would it be for me to help you take some bird pictures?"

I uncurled myself from the hammock. "You mean that you think that it would be more entertaining to follow me around all day instead of a golf ball?"

"Oh, no—easier. Why all you do is wander around and now and then snap your camera. It takes real energy to play golf."

"Dad," I said, "I'll give you a real day of it. Set your alarm for four-thirty."

Dad laid down his newspaper in speechless horror, but I had already gone into the garden, fragrant and lovely there in the June twilight.

We reached Sandcreek just at dawn, prepared and ate our breakfast. Dad had never heard of anyone paying any attention to a Kansas sunrise, but if anyone wanted his opinion on the subject this was not bad at all, even if he did have to get up at an unearthly hour to see it.

I paused, in frying the bacon, to watch a catbird. Along a nearby willow branch he swaggered, paused, opened his beak as if to sing, then changed his mind and slid up a few feet, down a few feet, opened his beak, flew to another tree and then returned to the willow branch. He drooped his head and tail dejectedly. Then, struck by an inspiration, he swelled his throat and uttered—a cat-like mew. He considered the effect, uttered another mew, reconsidered, then changed his position and burst into a vivacious song—clear and beautiful as the mocker's. "At last," I said.

"Your bacon has burned," Dad observed.

After breakfast I

A FAT GRASSHOPPER FOR LUNCH

Mother mockingbird comes home with a tidbit for a group of hungry mouths, wide open and waiting.

discovered the catbird's nest in a nearby sapling. Just afterwards I saw a flash of golden yellow against the dark green of a scrubby pine.

"Could it be? Dad, I think I saw a yellow warbler."

"Well, what of it?"

"Come on." I grabbed his arm and pulled him through cocklebur bushes and high scratchy weeds to this pine tree.

At our approach the father yellow warbler scolded and made little darts at our faces, while the mother bird quivered her wings, fell through the branches and did her heroic best to pretend to be wounded. It worried Dad a great deal.

A YELLOW WARBLER WAS FOUND AT HOME

Its nest, built of grass and spider web, was of silvery sheen and lured the photographer.

It would be an easy matter, I thought, to find the nest, but it was not. Dad looked carefully, almost painfully, and I searched every branch of the little pine, but no nest. The parent birds became more and more excited, and the sun, as it has a habit of doing in Kansas, became hotter and hotter. Dad stopped to consider the idea of all this and then on the tip of a branch he saw the nest, so tiny and fragile that he could hardly convince himself that it was really a nest he was gazing at. It was built of grass and spider web, the latter giving it a silvery sheen, and in it were two very small birds with wide open mouths. Dad was enchanted. No; I could not go back to the catbirds. I must photograph the warblers then and there.

So I sent him to the car after my photography outfit while I tied back branches to expose the nest to the light. Dad came puffing up with the camera under one arm, tripod over his shoulder, and all the films that I had brought for the whole day's work. I finally set up the camera and attached a string to the shutter. Then we hid in some nearby bushes and waited for one of the warblers to come to the nest.

"You must sit still," I whispered. Dad stopped fanning himself with his hat. Then, when the mother warbler neared the nest, Dad slapped at a mosquito and the warbler flew away. I groaned. "I'm sorry," expostulated Dad, and the father bird darted from the tree. An hour of fruitless waiting went by. It seemed

THE BROWN THRASHER SCOLDED FROM HER NEST

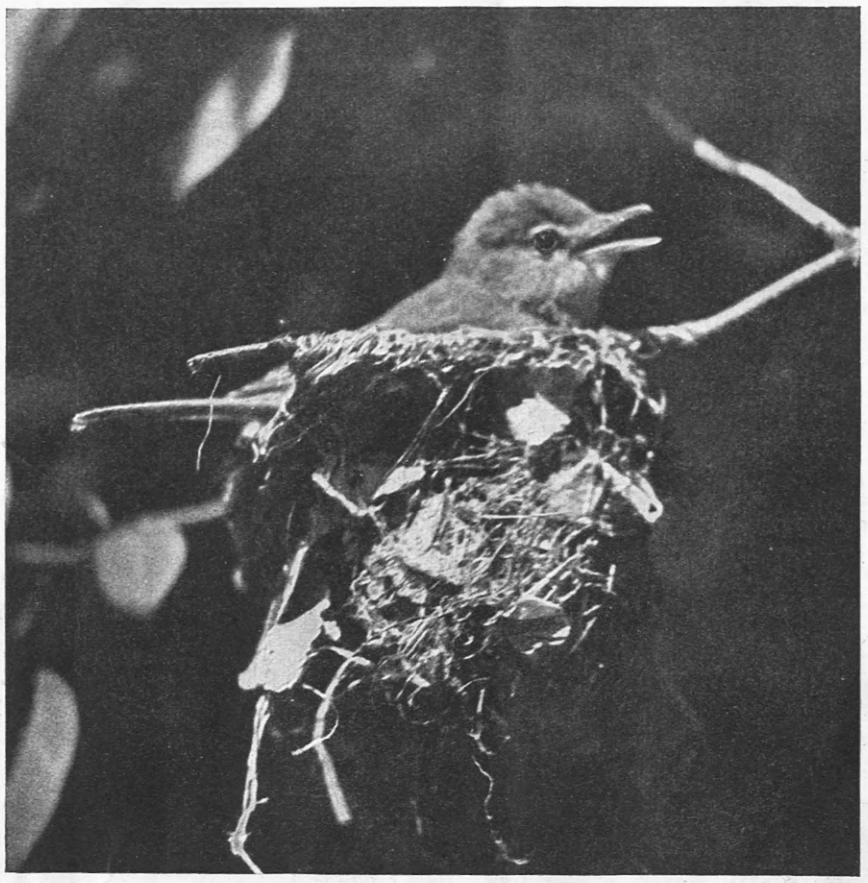
Dad insisted on taking her photograph and nearly upset everything by pulling over the camera and tripod in his enthusiasm.

that Dad always chose a time to shift his position or say something or cough or gesture just when the warblers were almost to the nest. I admit it was a great strain upon my disposition.

Finally the father bird came to the nest with a small caterpillar in his beak. He made an exquisite picture there—a golden bird on a silver nest against a dark green background. I tightened my hand on the string and pulled it. The shutter made the usual thudding sound, the warbler darted away, and I had the thrill that always comes to me when I have captured one of these lovely, elusive records of the out-of-doors. Dad was hilarious. Then we returned to the catbirds.

You who have had any experience with catbirds realize how thoroughly heathenish they can be at times. These catbirds were heathenish. They calmly preened their feathers and mewed in their most cynical tones, but they refused to go near the nest. It was maddening. Dad and I sweltered in the sun and unanimously decided that we loathed catbirds.

This time Dad let mosquitoes and flies literally chew on him while he remained motionless and resigned. I am sure that I heard him murmur something about giving up a perfectly good golf game for this trip among torturing insects.



A VIREO AT HOME IN A LILAC BUSH

In martyred silence, Dad stood by while the little home-body was well photographed.

Finally the mother catbird drifted like a gray shadow near the nest, glided away, and then returned. Just above the nest she perched, and I snapped her picture.

Dad gave a gasp of relief. "There are times," he announced, "that sitting still takes more energy than trying to beat par."

"You take the tripod and film holders while I take the camera," I said. "We're going to hunt for some more nests."

Dad faintly agreed.

We followed the creek, now and then pausing to watch the killdeers that abounded on its shores or a hawk drifting overhead. The creek brought us to a country road, and there I found a locust tree with a bluejay's nest near its top. So of course I insisted on climbing to the nest, in spite of Dad's protests, carrying along my camera.

The bluejays shrieked a very unfavorable opinion of me from a nearby tree, and Dad yelled with equal enthusiasm for me kindly not to fall and break my neck. It was all very disconcerting. But at last I fastened my camera to a branch so that it was focused on the nest, attached a string to the shutter, and descended.

Dad suggested that bluejays should be easy to photograph as they were so bold. As time went on, however, he concluded that he was mistaken. The camera aroused the suspicion of the jays, and they were too interested in it even to think of their hungry youngsters in the nest. We waited and waited and waited, and disliked the bluejays even more than the catbirds. But finally the mother bluejay deigned to alight on the nest, and I snapped the picture.

Dad insisted on climbing the tree to take down the camera. He exclaimed over scratches from thorns all the way up. He did not on the way down. Neither did he make answer to my remarks. The reason, I found, was that he carried the six-pound camera with the handle in his teeth. Later he considered going on a liquid diet.

Then we walked on, following the country road, Dad mopping his face and declaring that he was hungry. But no, I told him, one does not eat when bird picture hunting—there are so many other things to hold one's attention. Dad assented morbidly.

The road brought us to a farmhouse, where we asked for a drink. I happened to see a young barn swallow, caught it, and photographed it on the hand of a little girl.

"That," said Dad, "is the way to take pictures. Capture your specimen and then photograph it instead of coaxing it to the camera—simple and easy."

"There's a nest of baby bluejays just ready to fly. I'll go get one and you can take its picture," said the girl. And straightway she brought me one of these squawking barbarians. I decided to photograph it on one of the hollyhocks growing there in the yard.

Did you ever try to make a young bluejay stay any place that he did not want to stay? If so, I am sure that you found a bluejay's preference is a thing to be respected. I carefully, even tenderly, put the bluejay on the hollyhock. He immediately left. "I'll catch him," shouted Dad. The bluejay eluded his clutch over and over again, shrieking defiantly. The little girl giggled; it was just like a comedy in a moving picture show. But at last Dad cornered the little fellow and brought him back. This time he held the yelling imp on the hollyhock until I was all ready to take the picture. The bluejay squawked and struggled. I told him to relax his

over it as readily as though it were a piece of spaghetti.

hold slightly and the bluejay would quiet down. Dad did this, and the bird fluttered away. Dad caught him and brought him back over and over again. We tried everything —forced, coaxed, almost pleaded with the bluejay to stay on the hollyhock. My arm ached from holding the camera. Dad repeatedly assured me that if he chased that bluejay one more time he would have a fit of sunstroke.

The little farm girl was the only one to show even a trace of a sense of humor. Finally she took the bluejay in her small brown hands, patted it and gently crooned to it, then put it on the hollyhock and it stayed there. I immediately snapped the picture. Dad collapsed against a tree and demanded why that bluejay would not do the same thing for him.

Then we started walking again and found a vireo's nest in a lilac bush at another farmhouse, a brown thrasher's and mocker's nest in some evergreen trees. I worked all afternoon on these birds, taking a number of photographs of each, while Dad stood by in perspiring, martyred silence.

"I'd like to pull the string to take one of the pictures. How about it?" he said.

I agreed. So when the brown thrasher came to the nest he gave a mighty tug, completely toppling the camera over on its tripod. I gasped in horror and ran to see if the camera was hurt. Fortunately it was not, but Dad's nerves had neared a state of collapse.

In late afternoon we started back to the car, cutting across fields on the way. As we walked a bird flew up from before my very feet, and on stooping down I found the nest of the lark sparrow. It was an exquisite thing, but Dad showed no enthusiasm. He got out the tripod with a groan, declaring that he was too tired to exist much longer. I made the picture and took one last look at the cup-shaped nest with its white eggs scrawled in black. Then we went on our way.

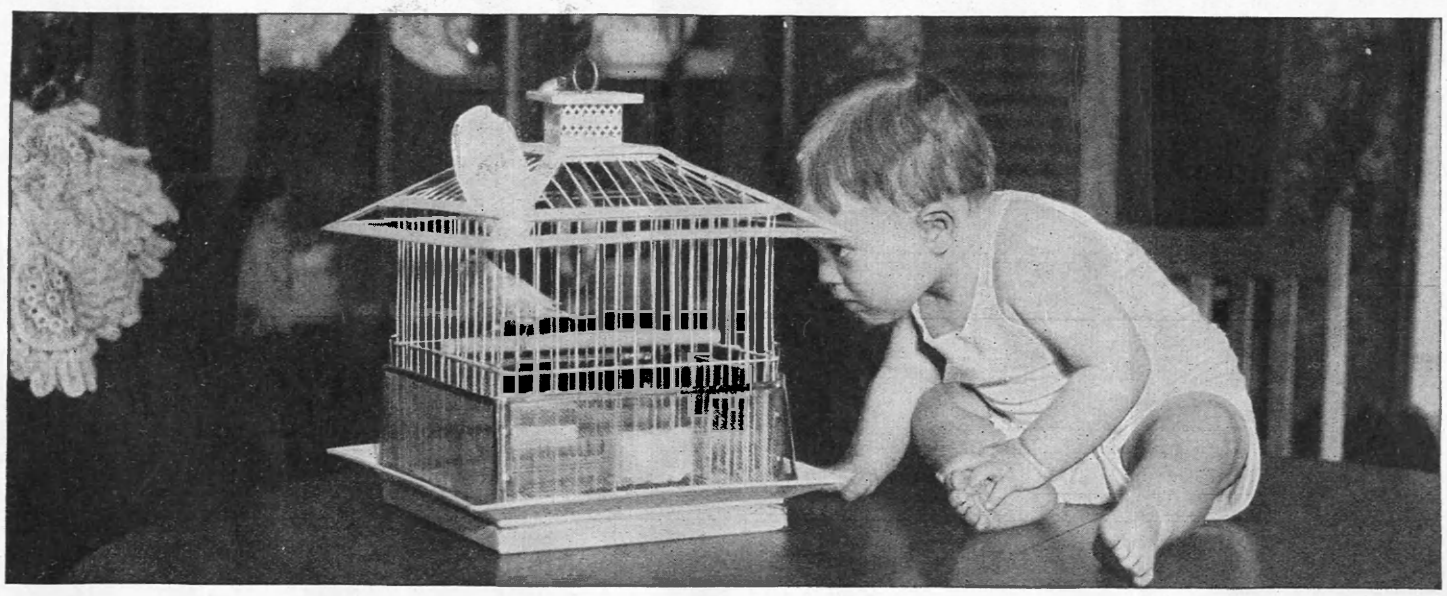
My small brother was on the porch when we drove up. "Did you have a good time, Dad?" he asked.

"My son, your father is a wreck," Dad solemnly assured him.

And mother is still wondering why Dad glared at her when she said, "I'm so glad you got into the country today, dear. Going around after bird pictures, as you said, is so much easier than playing golf, and I'm sure you needed the rest."

And although Dad never suggests going with me again, he holds the gentle art of bird photography in great respect.

A CANARY PRIMA DONNA



PHOTOGRAPH KADEL AND HERBERT

THAT canaries can follow the tune of an instrument as well as create their own songs has been proved by a Minnesota observer who writes after a morning spent in the sunshine with her bird:

"I have been playing the mouth organ here in the sun parlor, and Dickie, the canary, has been making a perfect monkey of himself. First I played an Indian song, and he danced up and down on his perch, jumped into the swing, and went through all sorts of antics, wiggling like a little whirligig.

"Then I played a slow, deep-toned hymn. He quieted down to sober attention. For a moment he sat still, balanced on the swing. Then he hopped to his perch and stuck his little head out between the wires at a wide place above his water jar. For a moment he sat there with his head slightly cocked on one side. Then he drew up to a very impressive height (I could imagine him folding prima-donnaish hands across a full bosom) and started a sweet trill, pitched several scales above my notes and in perfect harmony with my tune.

"I had known before that he would harmonize perfectly when he sang with other music going on in the house, but today he sang the sweetest accompaniment to my piece. Really, it was hardly an accompaniment. I think he produced the major melody and I played only a slow accompaniment for his lovely song. It was a beautiful thing."

Part II.

of the material for the building of this barrier was thrown about this rattler, but he glided over it as readily as though it were a piece of spaghetti. winder called. He me (Continued on page

A Good Word for Snakes

A Spirited Defense of Reptiles by a Man Who Has Studied Them for Twenty Years

WILLIS A. ROWE, the snake-man, fishing in the desert for rattlers.

By JOHN EDWIN HOAG

THE very words 'snake' and 'reptile' have long been synonyms for cold, slimy villainy, traits utterly lacking in those creatures themselves, and therefore applicable only to certain members of the human race. Scorned and neglected by most students of natural history, shrouded in ignorance, superstition and prejudice, reptiles are the most misunderstood and maligned form of animal life on earth today.

In recent years, however, some scientists have so far managed to overcome their prejudices as to study the reptiles. They have already turned sufficient earth in their search for knowledge to put a charge of high explosive under nearly every one of our pet snake stories and theories. They have proved to us that reptiles are by no means the menace to human life they are popularly believed to be. On the contrary, they show us that snakes pay big dividends to mankind in return for any mischief they do. We are told that while poisonous reptiles do occasionally cause the death of a human being, they save thousands of lives, and millions of dollars' worth of property for every life taken.

The writer is indebted to Willis A. Rowe, of San Fernando, California, for the inspiration and much of the material for the building of this article. Mr. Rowe is not a college man, nor is he connected with any institution or laboratory of biological research. He has no degrees, yet he enjoys the friendship and correspondence of many noted scientists, and is recognized by them as an authority on herpetology.

Twenty years ago he became interested in reptiles. He has studied them in the field, in his own laboratory, and in the reptile house which he established from his own funds upon his own property at San Fernando. His work is all the more interesting to the layman because he has concerned himself chiefly with the study of the life scheme and habits of reptiles, rather than with the number of scales on their backs, cellular structure of anatomy, and other details that would be uninteresting and monotonous to anyone but a student of zoölogy.

The chief harm man has done by foolishly killing every reptile he ever had a chance to kill, according to Mr. Rowe, has been to harm himself. It has been proved that the rattlesnake is dangerous to man only in self-defense. He helps man by killing off from 100 to 150 rats, mice, gophers, and ground squirrels every year. The rattler eats almost nothing else, and in doing this he helps man to feed himself through agricultural pursuits.

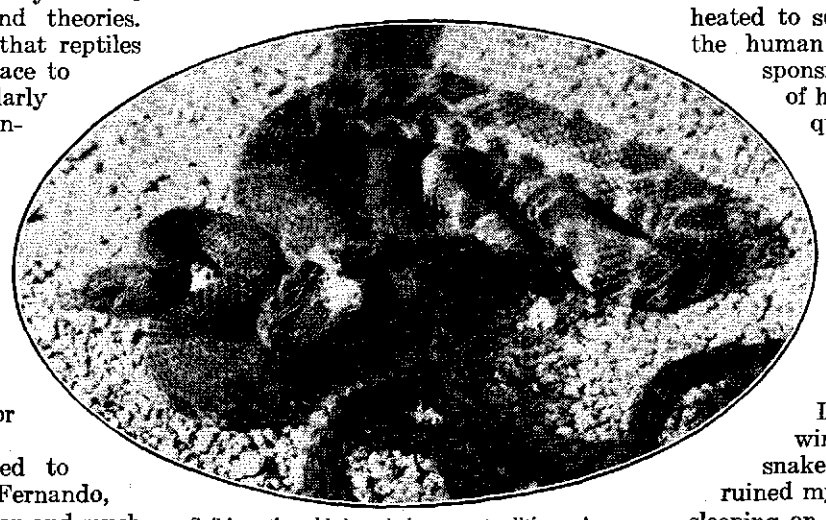
In the United States there are only three varieties of venomous reptiles whose bite may be considered dangerous or deadly. Ninety-nine times out of a hundred even a poisonous snake will retreat for the nearest cover at the sight of a human being. The rattlesnake may not always retreat, but he plays a fairer game than a lot of people. Crowd him, and he coils, lifts his tail, and gives off that buzzing, metallic sound, audible many feet away, from which he derives his name.

The different species of rattlesnakes are pretty generally distributed over the entire United States. California probably has more of them than any other state in the Union, with the possible exception of Texas. There was only one death from rattlesnake bite in the state of California during 1925. This fact is significant because it proves conclusively that no one source of danger to human life in the West has been more outrageously exaggerated than the so-called rattlesnake peril. Hundreds of thousands of persons sought recreation in the 'rattlesnake country' last year. Only one life was lost!

My mention of snake-bite kits to Mr. Rowe brought up a long list of inherited misinformation stories about snakes. This included the old, horsehair rope hoax. It started many years ago, being given motive power probably by somebody who had a lot of horsehair ropes to sell. Systematic propaganda, taking advantage of public ignorance, set in motion the story that a rattlesnake will not crawl over a horsehair rope. Just why the rattlesnake's 'tummy,' impervious to cactus thorns, sharp stones, and rocks heated to solar temperatures to repel the human hand, should be so responsive to the unknown magic of horsehair doesn't seem to be quite clear. But that's the story just the same.

Thousands of persons have bought the ropes, and probably have got their money's worth out of them by soundly sleeping in the belief that no rattlesnake would invade the horsehair bounded circle.

It was a little desert sidewinder, the small gray rattlesnake of the arid regions, that ruined my faith in horsehair. I was sleeping on the ground when the sidewinder called. He came (Continued on page 80)



Spiking the old horsehair rope tradition. A rope barrier was thrown about this rattler, but he glided over it as readily as though it were a piece of spaghetti.

A Good Word for Snakes

(*Continued from page 2*)

A horned toad being captured by Mr. Rowe's fishing pole.

right into camp as if he'd been invited—and right over my barrier of horsehair rope, paying no more attention to it than a migrating waterfowl does to an international boundary. He stopped within about six feet of my blankets when I put down a barrage of lead from an automatic pistol.

Another rattlesnake story which Mr. Rowe exploded was the one to the effect that a coiled rattlesnake can be killed with a pistol without the weapon wielder taking the slightest aim at the snake's head. The story goes that as the coiled snake always holds his head in a direct line with the hole in the end of the gun barrel, it is necessary only to point the barrel in the general direction of the reptile and pull the trigger. Mr. Rattler, of course, gets his head splintered by the bullet!

When I asked Mr. Rowe about this, he laughed uproariously, and said: 'Go out and try it!' 'Then you don't believe the story?' I asked. 'Not by a jugfull,' he answered. 'I've tested that theory many times, and I can tell you for a certainty that unless you're a pistol marksman, you can miss your snake just as easily as you can miss the rabbit that you want for your dinner!'

This question suggested others. I asked the herpetologist about the hoop snake—the one that is supposed to take his tail in his mouth and roll at his victim like part of a keg. I asked him about the blue racer's propensity for chasing small boys out of the woods. I asked him about the joint snake—the snake that 'goes to pieces when struck—the pieces running in all directions, and later getting together again.'

I asked him about the snakes that are alleged to swallow their young as a means of protecting them until they can be safely disgorged. I asked him about the snapping turtle's alleged propensity for biting a victim and hanging on 'until it thunders.' I asked him about the snake with his head cut off 'remaining alive until sundown,' and many other fool questions. To each of these questions, individually and collectively, he replied: 'There is absolutely no scientific proof to support a single one of the popularly believed snake stories. They are inherited misinformation pure and simple—great-grandmother tales, told to keep the children at home, and to scare them out of wandering away. Some of the most widely circulated snake stories undoubtedly originated from the contents of bottles and jugs.'

'How did you become interested in reptiles, Mr. Rowe?' I asked. To this the scientist replied: 'I've always been a student of biological science. Twenty years ago I began studying reptiles because they were the one form of animal life that could not be studied from books or other conventional sources. I realized that here was a tremendously interesting and important field for research almost untouched by scientific men.

'I went to work, and I regret to say that I soon found myself stumbling over the public prejudice against reptiles.

'I found even my friends regarding me as queer, morbid, or even mentally unbalanced.

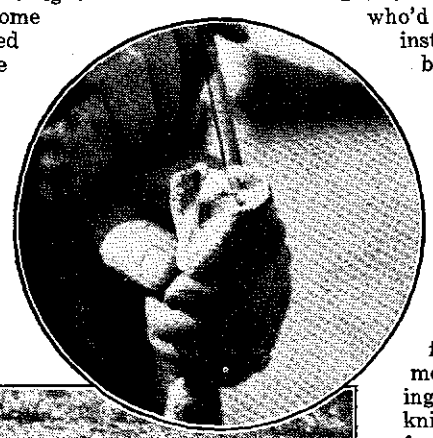
'By others I was set down in a class with street fakers, patent-medicine quacks, side-show snake charmers, and similar gentry, who long ago learned the value of taking advantage of public ignorance and using reptiles to attract attention.'

This drew out stories of some of Mr. Rowe's adventures in the field, several of which are worth repeating. 'I have long ceased to care what poor ignorant fools think of me,' he said. 'I used to go sneaking around trying to keep out of sight. But in recent years I have gone right ahead with my work. Some day those who have laughed at me will wake up to the fact that they were more ignorant than I am crazy.

'Perhaps the thing that has stamped me for a lunatic oftener than anything else is my method of catching reptiles for study. After trying all the conventional methods, I devised one of my own which I believe is the best. I catch my snakes, lizards, and other reptiles with a trout rod. I put a slip noose over his head. When the reel is wound up the snake is captured. It enables me to work at a safe distance, gives the reptile no possible opportunity for mischief, and is the surest way of bringing it to bag. I have also learned that there is no better receptacle for carrying live snakes and lizards than an ordinary trout fisherman's creel.

'Now, you can imagine what happens when people see me working out in the desert—perhaps miles from the nearest water—and casting about in the sagebrush and cactus with that kind of a rig. They take one look and say to themselves: "There's an enthusiastic trout fisherman who's gone nutty on the subject. Look at him! The poor fellow thinks this desert is a trout pool." Why! I even had a couple of deputies come out after me once. I was working just off the public highway in the Mojave Desert not far from Bakersfield. People in motor cars stopped to look, and I saw one man make a motion indicating wheels in the head.

'A little later a car rolled up from the direction of Bakersfield. Two big huskies got out and came toward me. One of the men with a kindly, pleading expression, said: "Come with us, Isaac. We'll show you a stream where you can catch bigger and better trout than you're getting here." When I assured them I was not interested in trout, one of them asked: "Then, what in helzbelz are you doing out here dangling a trout rod and line in this desert?" "Snakes!" I replied. "Bugs!" exclaimed the pair simultaneously. I then learned that the men were deputy sheriffs, sent out to capture the crazy man who had been reported at large in the Mojave Desert. But the joke of it was that it took me twenty minutes to convince those men that I was not one of three lunatics who'd escaped from a state institution several days before.'



'Were you ever bitten by a rattlesnake?' I asked. 'Twice,' he replied. 'Once I got nipped on the side of my left hand trying to catch a big diamond-backed rattler. I was miles from the nearest doctor at the time, and had no outfit for the emergency treatment of the wound. Gashing it with my pocket knife I made it bleed freely, and suffered no ill effects whatever. The second time I bled the wound and then injected potassium permanganate hypodermically. There were no ill effects, and in a few days the wound healed the same as any other minor injury should do.

'I've been bitten many times by non-poisonous reptiles—probably because I don't take the precautions in handling them that I do with the poisonous varieties. Their bites are merely

Above—The rattlesnake *strikes;* he does not *bite.* His fangs are [illegible] at the base and muscularly controlled. Below—A captive rattler, just after the noose [illegible] over his head.

pin-pricks, requiring no treatment other than the application of an antiseptic to avoid the possibility of infection. Although I have demonstrated to my own satisfaction that the bite of a rattlesnake is not necessarily deadly, or even dangerous, herpetology, dealing with them as live specimens, is no pastime that I would recommend for an amateur.'

In summing up his twenty years as a specialist in herpetology, Mr. Rowe said: 'Experience has convinced me that about ninety-eight per cent of all fear is either superstition or ignorance. About two per cent of it is genuine, common-sense fear of a definitely known and established danger. I have no superstitions whatever because they have no place in science—particularly biological science.

'We are just now waking up to the fact that the reptiles are about the same sort of victims of misunderstanding, ignorance, and superstition as the birds were twenty years ago.

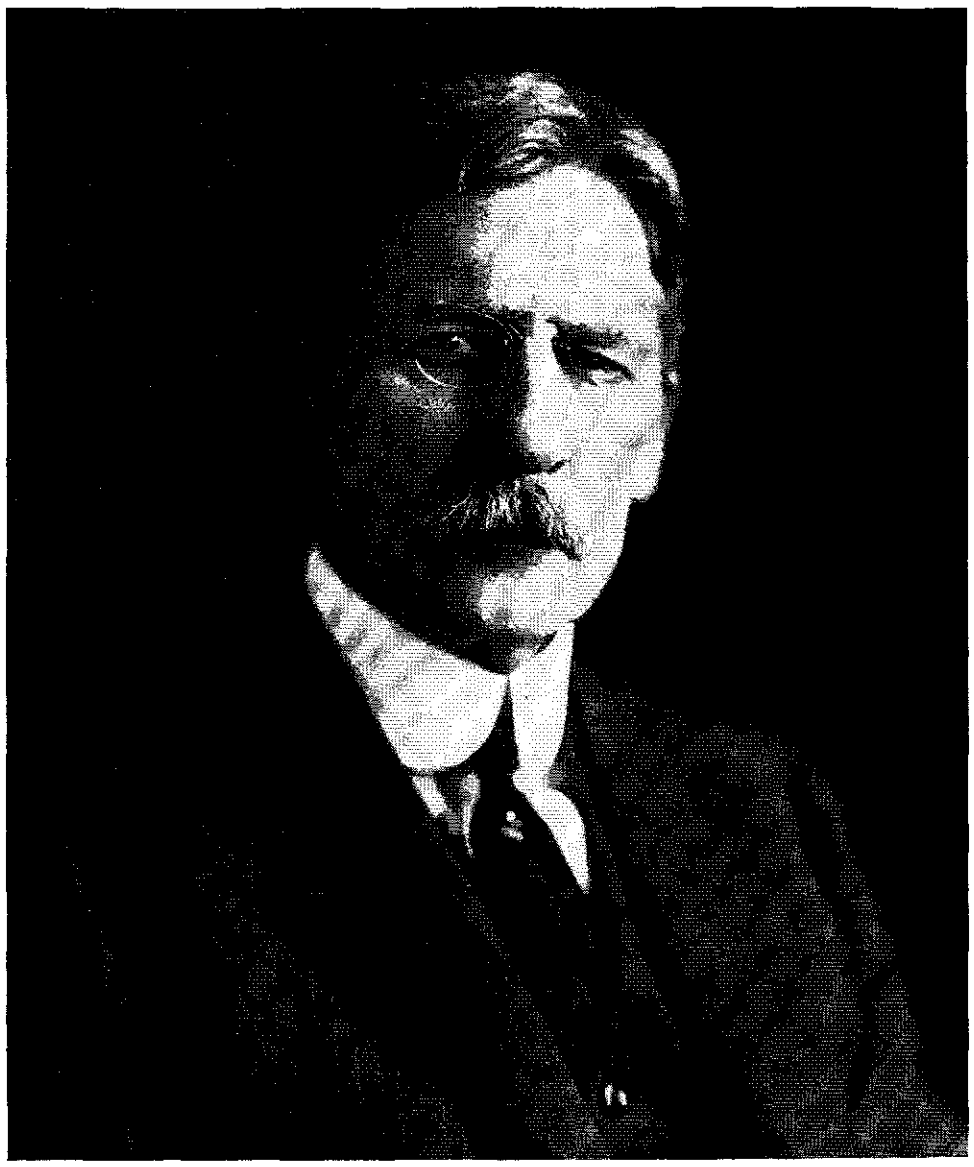
'While it is true that certain reptiles destroy the nests and eggs of a few game birds, they more than repay the sportsman by killing rodents that destroy far more game than the reptiles themselves ever eat. It may therefore be said that the reptiles are as much of a benefit to the sportsman as to the farmer.

'The only exception that should be made to permit the destruction of reptiles is in those rare instances where venomous species may become a source of danger by reason of being in populated areas.'

RECORDING THE PAST DESPITE WIND, FLIES, AND HEAT

OUTSIDE the temple of Medinet Habu, at ancient Thebes (usually known as Luxor), an artist-draftsman is drawing in ink on enlarged photographs of the temple walls. He is tracing the lines of the original inscriptions, after which the rest of the photograph will be bleached out, leaving only the ink lines, from which blue-prints will be made for further study. Frequent "proof-reading" (see page 202) insures correctness of the reproductions.

When the marriage ceremony has been



FRANK J. SPRAGUE

FOR his many important achievements in the field of electrical traction and his development of electrical elevators and their control, constant speed motors, and automatic remote control systems, both as a pioneer and as a diligent worker even now at the age of 75, tribute was rendered by many notables to Dr. Sprague recently on the occasion of his birthday. One of our really great electrical pioneers, he has been called the father of electrical traction. He was the first to demonstrate, in 1886, the practicability of motors for railway use. When others were skeptical of the practical value of alternating current, as opposed to the direct current upon which, in the early days, the future of electricity seemed to be based, he advised active prosecution of alternating current development. Dr. Sprague was the first to apply electricity to the elevator, and to the present day has continued his work in that field. In 1926, he perfected the first operative dual elevator.

Dr. Sprague was educated at the United States Naval Academy 1874-1878, resigned from the Navy in 1883, was an assistant to Thomas A. Edison for a year, and then formed his own company, the Sprague Electric Railway and Motor Company which later merged with the Edison General Electric Company. He then formed the Sprague Electric Elevator Company and finally the Sprague Electric Company.

Old Wooden Water Mains Unearthed in London

THE evolution of the underground piping system of a large city could be partly traced in the Bloomsbury district of London, England, when replacement work was undertaken, following a series of gas main explosions, and a number of old wooden pipes used in bygone days for the transmission of the city's water and gas supplies was unearthed. The increase in the city's water consumption was clearly demonstrated by the difference in bore between these old wooden pipes and the steel mains installed in their place. Moreover, the decrease in the thickness of the material in proportion to the bore of the pipe, through the progressive stages of wood, iron, and steel conveyors, bears eloquent testimony to the ever-growing efficiency of engineering. Above are shown sections of the old wooden mains.

Autumn Leaves Still Gay After Millions of Years

PALEOBOTANY, the science of flower fossils, has lately brought to light some unusual specimens, autumn leaves millions of years old imprinted on rock with the original colors retained. Dr. Ralph W. Chaney, palcobotanist of the Carnegie Institution in Washington, reports the finding of these curiosities in newly discovered fossil leaf beds of Wheeler County, central Oregon. He predicts the fossil flora found in this region will throw important light on numerous extinct plant species which must have formed a semitropical jungle in primeval Oregon.

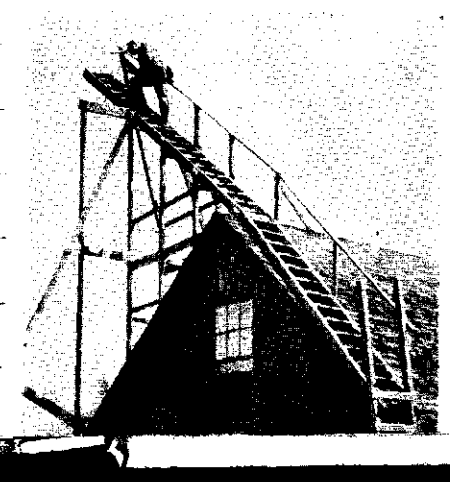
How the autumn leaf fossils preserved their color is still a mystery, but it has been explained tentatively by the presence of minerals in the rock bed.

Builds Novel Telescope in His Back Yard

FOUR hundred individual lenses mounted on a wooden rack are being designed to provide a reflecting surface of 100 square feet in an unusual experiment in telescope construction by C. W. Woodworth, professor of entomology at the University of California. If it is completed and proves successful, it will be the largest reflector telescope in the world. At present the largest is the 100-inch reflector of Mount Wilson Observatory in California, made of one solid piece of glass.

With the aid of his novel instrument, Professor Woodworth expects to see and photograph the largest image ever made of a heavenly area. He has worked for two years on this telescope, grinding each of the 400 lenses with a special apparatus and fitting them together.

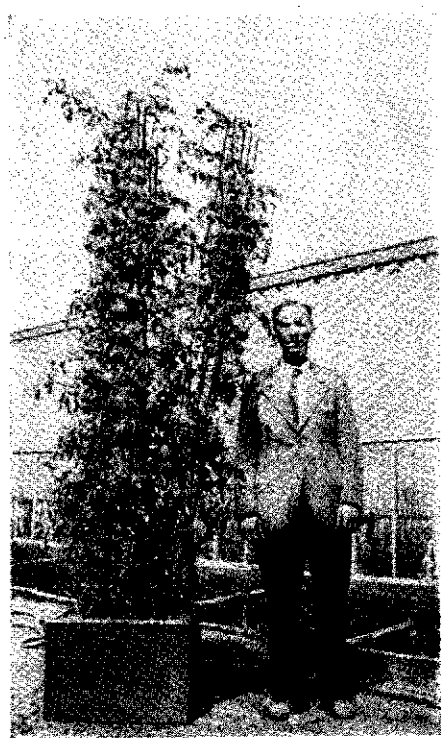
The instrument is being built in the professor's own back yard. On top of his barn, sixty feet away from the reflecting mirror, he has erected a scaffolding on which he will mount an eyepiece. Through this he will make his observations, picking up the image reflected by the united lenses.



"IN THE GULF STREAM"—By Olive Earle

the "absolute" humidity, which means the quantity of water vapor in the air at the time of observation. It is usual, however, to find that the loss of power on a muggy day is not especially noticeable, since excessive moisture may be counterbalanced by the effect of air temperature. Another factor which governs power is the atmospheric pressure which so balances one another that no variation in engine power is observable.

Tomatoes, Potatoes Grow on the Same Plant



The remarkable "tomapotato" plant, ten feet tall, overtops its creator, Oscar Soderholm.

THE "tomapotato," a new plant demanding a new name, which produces potatoes at its roots below the ground and tomatoes on its stalk above the earth, has been developed after twenty years of experiment by Oscar Soderholm, foreman of a florist's greenhouses at Worcester, Mass. The plant is no freak, but is the demonstration of Soderholm's theory that, as the roots of the potato plant are stronger than those of the tomato, the combination should produce better tomatoes. His results have proved the soundness of the theory, he claims, for not only does his hybrid grow potatoes but the grafted tomato section attains a height of ten feet, if supported, and bears more fruit than a normal plant.

In grafting his queer plant, Soderholm starts by planting a piece of potato, containing at least two eyes, in the ground, and planting tomato seeds in a pot. When both have grown to vines about one quarter of an inch in diameter, he makes a cut diagonally across each; then he matches them and ties the grafting together with a thread. Special care must be taken to prevent wilting.

Soderholm now plans experiments in grafting cucumbers on Hubbard squash, the roots of the squash being much the stronger of the two.

New Gas Treatment Ripens Fruit in a Few Hours

THROUGH a process developed in the research laboratory of the United States Department of Agriculture, fruit that would take many days or weeks to ripen on the trees may be ripened in storage in only a few hours by treating it with ethylene gas. The treatment may also be used, it is said, to color the fruit and to add to its sweetness.

The photograph above shows W. G. Sorber, junior chemist in the laboratory, examining a tray of pears being gassed.

Though brightness in color is no gage of the flavor of fruit, most people seem to prefer more brilliant-toned oranges, for example, to the lighter hued and often tastier variety. With the ethylene treatment, fruit may have its color deepened to satisfy the demand for brightness.

Moreover, fruit crops may be better controlled. Instead of a crop's being put on the market all at once, it may be gathered in instalments, and each instalment ripened quickly through the artificial process while the remainder continues its slower process of natural ripening on the tree.

Largest of Submarines Launched in France

THE world's largest submarine has been launched at Cherbourg, France. The *Surcouf*, 400 feet of steel naval defense, has complete armor protection for all vital parts exposed when running at the surface. This makes her really an armored cruiser, as she can withstand the shells of light quick-firing guns and can return fire. Her displacement is 3,257 tons at the surface and 4,330 tons when submerged. The biggest submarine in the war, the *U-139*, had a surface displacement of 1,930 tons, and 3,050 tons when submerged.

The *Surcouf* can make twenty-five miles per hour, five miles faster than the *Humayta*, recently built in Italy for Brazil. She will carry four 5.5-inch guns, fourteen tubes which can be used all at the same time, and will have a small seaplane stored on board. Officers and crew will number 150.

The heavy armament of the new battle whale will enable her to sink to a depth of 430 feet, 100 feet deeper than any previous submarine. She will have a fuel capacity to take her 13,000 miles, or halfway round the world, without a stop.

Predicts Earth May Grow Rings Like Saturn's

SOME day the earth may have rings like Saturn's. This possibility was suggested recently by Dr. Harlow Shapley, director of the Harvard College Observatory.

Saturn's rings are held to be composed of myriads of tiny moons. The earth's rings, according to Dr. Shapley, would be formed from fragments of the earth's moon. It is known to be approaching the earth, because of the gradual slowing down of the solar system. At a short distance, this expert predicts, the earth's tidal forces will break it up. According to Dr. Shapley's figures, this may happen about A. D. 50,000,000,000.

Silencer Reduces Noise of Street Drills

A PARTIALLY noiseless pneumatic drill for tearing up city streets and similar excavation work has been tested in London and found to be successful. It is said to reduce the noise of drilling by more than sixty percent.

Two methods of noise prevention are used. One is the principle of the silencer, by which the noise of the exhaust air let out of the drill's air chamber at the end of each stroke is partly prevented, as is done by the silencer on a gun or the muffler on an automobile engine. The second is a redesign of the valves controlling the motion of the compressed air through the apparatus, so that these valves move through much shorter distances and make less noise when they strike the walls of the cylinder.

Equipped with silencer, this pneumatic road drill is said to reduce noise sixty percent.

PROGRESS AND DISCOVERY

Developments in engineering, exploration, and discovery, and news of the world's progress in science are recorded on these pages. Here are included the interesting features previously presented in "Back of the Month's News."

Panning for Gold—The Old and New Ways

REMINDERS of the days of '49 may still be found today in the dogged prospectors who still haunt the streams of northern California panning for gold. They always hope that they will find the mother lode. The modern methods of prospecting are electrical. Apparatus is used which can detect an underground vein without the need for digging an ounce of earth (P.S.M., Feb. '29, p. 26). Gold dredges, some of them 200 feet long, and with huge arms spreading 400 feet, pan the precious metal in bulk.

In northern California the largest gold dredges in the world are operated. During twenty years of excavation more material has been turned over there than in the construction of the Panama Canal. The dredges plow through virgin soil down to solid rock. They can dig eighty-two feet below the water line. The stream bed is dredged up, passes through filters, and the gravel cleaned of the gold is thrown by the giant conveyor arm to the shore. Rock-crushing plants are installed in the wake of the dredges.

Above: Giant electric gold-panning dredge working a stream in northern California. Left: A prospector of the old school panning by hand.

Forestry Weather Bureau Travels by Truck

WEATHER forecasts from almost inaccessible regions will now be practical, it is said, by the use of a new traveling weather bureau recently sent to the Sierra Madre Mountains for the United States Forestry Service. The equipment, housed in a motor truck, consists of an elaborate radio receiving and transmitting equipment plus all the usual instruments necessary to measure wind velocity, humidity, and barometric pressure. It will meet the need of obtaining accurate information of weather conditions at points threatened by forest fires.

A California deputy fire warden tuning the radio set of the new traveling weather bureau.

Huge X-Ray Tubes Produce Man-Made Radium Rays

A BATTERY of giant X-ray tubes immersed in a tank of oil and operated at the electric pressure of 1,600,000 volts produced man-made rays like those of radium in a recent demonstration at Washington, D. C. The experiment, performed by the Carnegie Institution, was a step forward in attempts of physicists to break down the atom itself. If this can be done, it may be possible to "transmute" one element into another.

For this purpose the Carnegie Institution built a huge electric machine, consisting of a giant spark coil in an oil tank capable of generating electricity at 5,000,000 volts (P. S. M., Jan. '29, p. 23). Vacuum tubes capable of applying this tremendous voltage, however, remained to be constructed. The new arrangement of X-ray tubes promises a possible way of doing it. Immersing the tubes in oil and shielding one from another permits higher voltages. The rays feed from one tube to the next, an arrangement developed originally by Dr. W. D. Coolidge of the General Electric Company for hooking up cathode ray tubes.

Dynamite Blast Travels Four Miles a Second

WHEN a stick of dynamite goes off, the wave of explosion travels along the cartridge at four miles per second, one of the fastest chemical "reaction" speeds known. Experts at the laboratories of the United States Bureau of Mines at Bruceton, Pa., have been measuring this speed by a clever mechanism called the mettegang (German for "go-between") recorder. This measures the time elapsing between the rupture of two wires threaded through the dynamite stick by recording it on a rapidly whirling smoked drum.

Excess Humidity Reduces Auto Engine Power

A POPULAR impression among motorists has been that automobile engines run better in muggy weather. That the opposite is true is now revealed by recent tests on six-cylinder engines, announced Daniel P. Brooks of the Bureau of Standards of the United States Department of Commerce. They have shown that loss of power is directly proportional to the excess of moisture in the air. But strangely enough, this does not necessarily mean less power when it is raining, as it is quite possible to have less moisture in the air on a cool rainy day than on a hot, muggy one.

The loss of power is proportional to

Pour Glass for World's Greatest Telescopic 'Eye'

Scientists Watch Workmen Cast Twenty-Ton Reflector, Hope of Astronomers

CORNING, N. Y., March 25 (AP)—Twenty tons of molten glass, to form the world's largest telescopic "eye," were poured into a form today before a distinguished audience of scientists and thousands of laymen who taxed the hospitality of this famous little city of glass makers.

By nightfall the last ladle of brilliant glowing glass was spread in the brick form which will stand 10 months while the composition hardens. Ten hours were required to transfer the liquid glass from the furnace, where it has been heating since February 15, to the mold housed in a brick igloo.

If, as scientists anticipate, the 200-inch mirror emerges from the annealing tank flawless, it some day will enable man to gaze into unfathomed depths of the great void beyond the earth.

The astronomical vision, if all steps of the experiment are as successful as those already taken, will be increased fourfold.

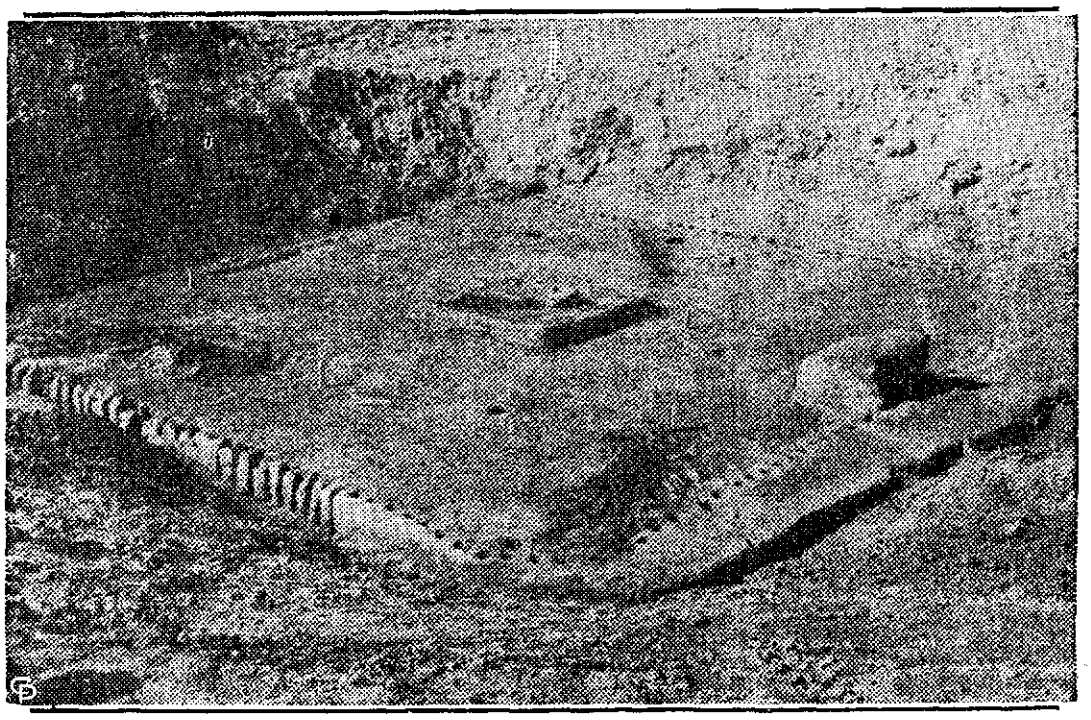
High speed photography, instead of immense images, will be the secret of the power of the 200-inch telescope to see four times farther, and peer into a volume of space 30 times that now visible.

The 200-inch mirror will take celestial protographs 10 times faster than previous telescopes. That speed, contrary to popular view, is how astronomers expect to use the great mirror to solve new mysteries of creation.

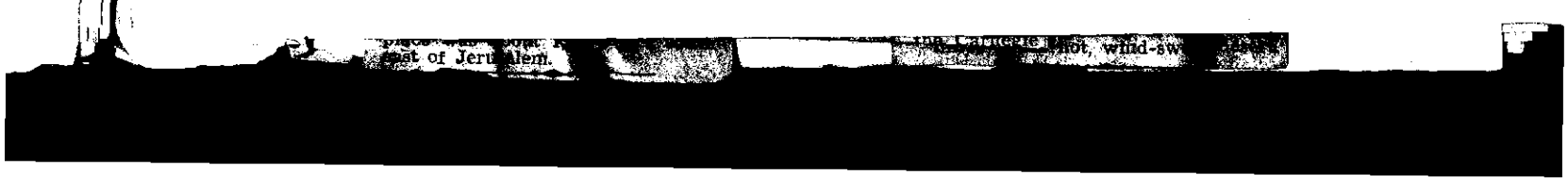
The mirror will be 17 feet in diameter, but it will not form 17-foot images of stars. It will collect four times more light than the present largest, the 100-inch telescope on Mt. Wilson. Much of that light comes from far regions never yet seen.

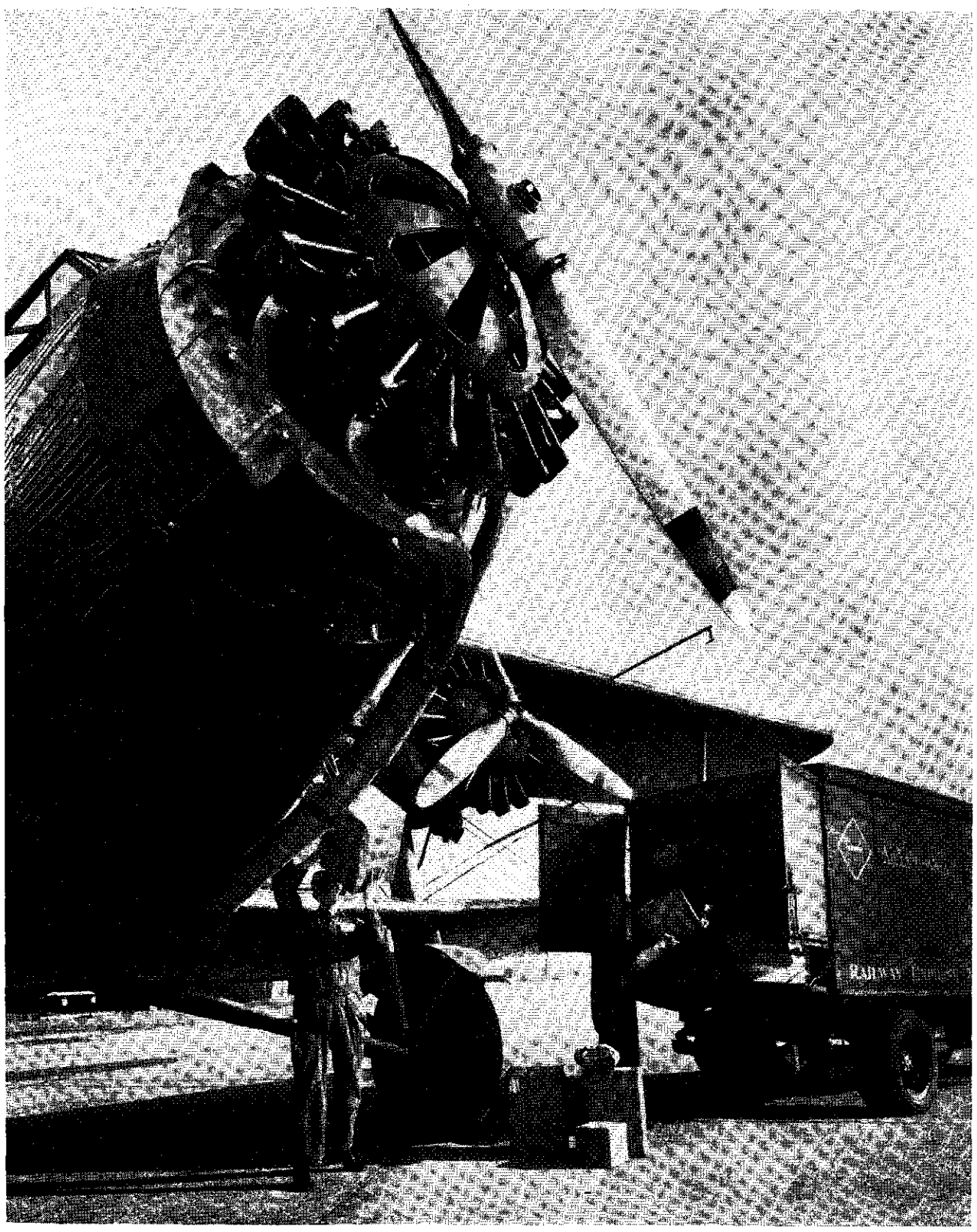
"More light" is the objective of the great telescope. "More light" includes rays never visible to the eye, both ultra-violet and infra-red. But these rays, like the visible, register on photographic plates, are "visible" to photoelectric "eyes," and when passed through a prism show on the spectrum the sort of atoms which give rise to each ray. Even the heat of stars reflects the same as light, in fourfold greater volume, form the great mirror, and is made to tell its story.

Ruins of Ancient Temple in Tennessee



Here is an air view of the ruins of an ancient temple, which has been unearthed by the archaeological expedition headed by Prof. W. S. Webb, in charge of TVA archaeological work, near Knoxville, Tenn., the first of its kind ever found in the United States. The temple, about 35 feet square and with a sacrificial altar in the center, was unearthed near Powell river, at Cadam Bend. It is believed to have been built by an unknown race that antedated the Indians.





AN EIGHT-TON, 1575-HORSEPOWER LEVIATHAN OF THE AIR

AN unusual view of the nose engine, one of three 525-horsepower Hornets (see also page 45, July, 1932 SCIENTIFIC AMERICAN) that drive this one of the United Air Lines' coast-to-coast planes. These Boeing transports must climb from sea-level to 12,000 feet in their cross-country flights, carrying 14 passengers and 1000 pounds of mail and cargo.

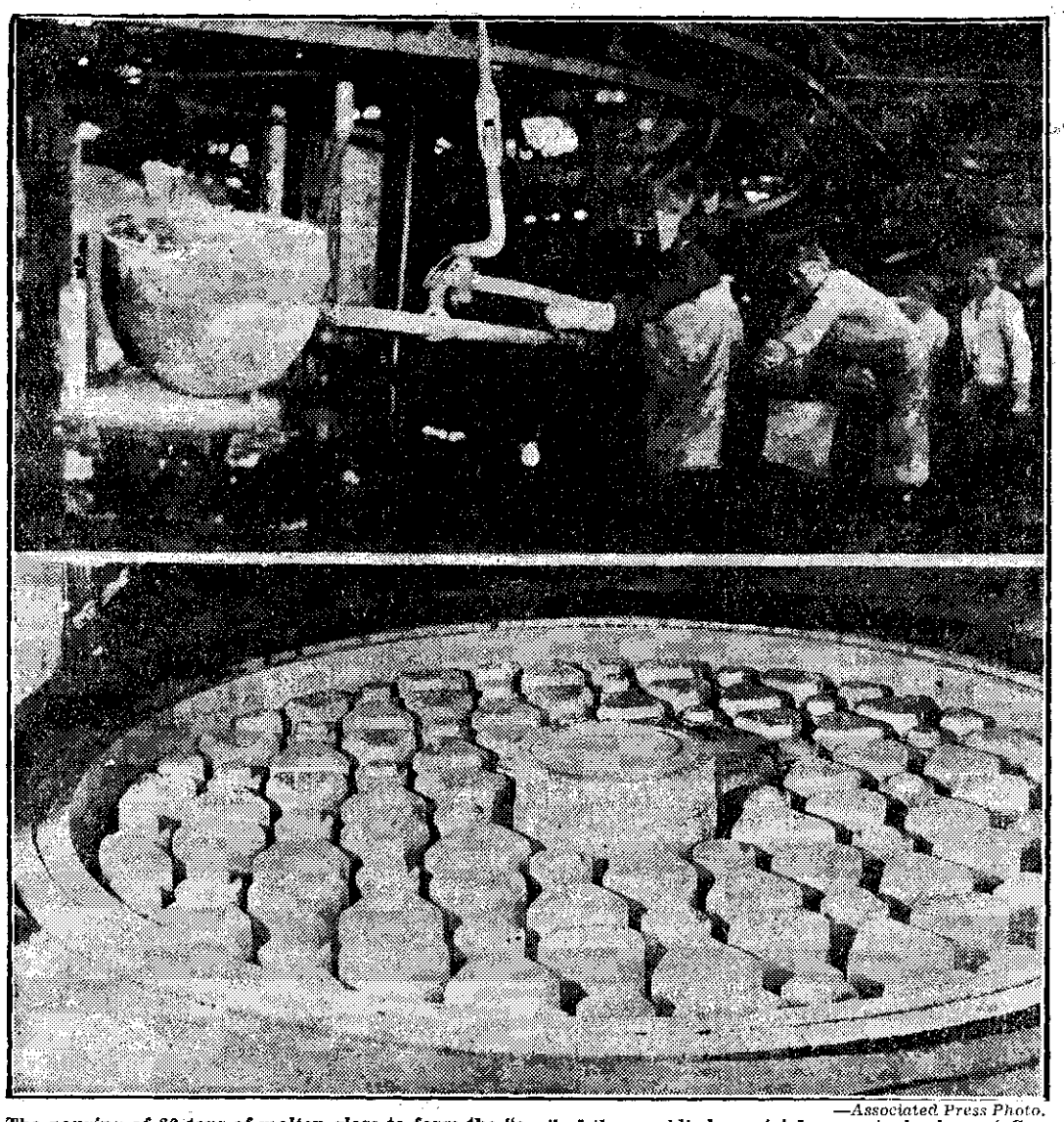
Courtesy of *Nature*, London

LORD RUTHERFORD of Nelson, until recently Sir Ernest Rutherford, is Director of the famous Cavendish Laboratory of Physics at Cambridge University, and by common consensus is the dean of the world's physicists. He was born a New Zealander (today he is called New Zealand's greatest son), and was educated at Cambridge in the same laboratory of which he is now the distinguished head.

Lord Rutherford combines two flairs: He has a flair for experimentation and, on account of his ingenuity in devising apparatus for difficult experiments in atomic physics, he has been described as the most skillful experimenter living. He also has a flair for leadership, his influence over other physicists at the Cavendish Laboratory having been truly enormous.

Of his experiments everybody knows; they led to our fundamental knowledge that the atom is not just a hard pellet, as was naïvely thought at one time, but is a whole world in itself. Of his leadership the French physicist, deBroglie, in a eulogy recently published in *Nature*, Great Britain's leading scientific journal, says; "The list of the physicists who have worked under his direction is a long sequence of names of which the greater number have attained fame." Two examples of this kind are presented in articles in the present number; the recent discovery of the neutron and the splitting of the atom are triumphs reflected from Lord Rutherford's inspiration to others.

'Eye' for Largest Telescope Poured



—*Associated Press Photo.*

The pouring of 20 tons of molten glass to form the "eye" of the world's largest telescope took place at Corning, N. Y., in what was regarded as an epochal step in scientific achievement. The mold of the "eye," or mirror, of the 200-inch telescope is shown below. Above is a huge iron ladle from which the glass was poured. The crew leader is helmeted against the glare. It took a month to heat the glass and it will take 10 months to cool it.

20 Tons of Molten Glass Go Into Making of Mirror

By GEORGE ELLERY HALE

Honorary Director, Mount Wilson Observatory of the Carnegie Institution of Washington.

Written for the Associated Press.

THE construction of the 200-inch telescope is necessarily a long and difficult process, requiring much study and research.

At present the important news item is the casting, at Corning, of the 200-inch disc from which the telescope's mirror (used in such an instrument instead of a lens) will be ground, polished and figured with great accuracy in Pasadena.

Because of its increased size this mirror will collect four times as much light as the largest eelescope mirror previously made. If figured with equal accuracy it should concentrate all of this light in a very minute star image.

Moreover, because of its shorter relative focal length, it should act like a "fast" camera lens, the ratio between aperture (200 inches) and focal length (55 feet) being in the proportion of 1 to 3.3. In previous large reflectors this ratio has been 1 to 5 or 1 to 6. Therefore, the great concentration of light should correspond to increased "speed."

Taking also into account various new auxiliary attachments, we hope for a "speed" at least 10 times as great as we have previously enjoyed. This means that the 200-inch telescope should reach fully three times as far into space and thus open for exploration a sphere of 27 times the volume of that previously sounded.

It should be remembered that all the important discoveries by Adams, Sears, Hubble and others with the 100-inch Mount Wilson telescope have been made with low or very moderate magnifying power. Eyepieces with high magnification are not used with great reflecting telescopes, and there is no warrant for the stories regarding expectations of observing "skyscrapers on the moon" or flirting with "the inhabitants of Mars." As Doctor Adams and Doctor Dunham have recently proved on Mount Wilson that the atmosphere at the surface of Mars contains not more than one-tenth of 1 per cent [illegible]xygen, any possible "inhabitants" [illegible]d barely afford to waste any breath in efforts to communicate with the earth.

It is evident, however, that the 200-inch telescope has plenty of problems to solve. None of these interfere with the splendid work of the 100-inch telescope, just as the 100-inch did not displace the 60-inch, as both are in constant use every night on Mount Wilson.

Most fortunately, through the friendly co-operation of the Carnegie Institution of Washington, the Mount Wilson astronomers, from the outset, have done the chief work of designing the instruments and planning the policy of the new observatory of the California Institute of Technology. In the same way their long experience with the 100-inch reflector will enable them to use the 200-inch re[illegible] advantage. In other words, the [illegible] Institution of Washington and the California Institute of Technology will continue to work in the closest co-operation, and in no sense as rivals.

This unity of purpose indicates the nature of the problems we have in view. Thus the unique and fruitful work of Doctor Adams and Doctor Dunham, involving the most complete analysis hitherto made of the light of the stars and planets, can be extended and developed when more light becomes available. In a similar way Dr. Hubble and Mr. Humason can push outward their analysis of the light of the remote nebulae, and give us additional information on the fundamental problem of the "expansion of the universe." Thus also Messrs. Dunham, Stebbins, Nicholson and Pettit can extend their researches on the radiation of nebulae and other objects, using thermoelectric amplifiers, thermocouples and other devices.

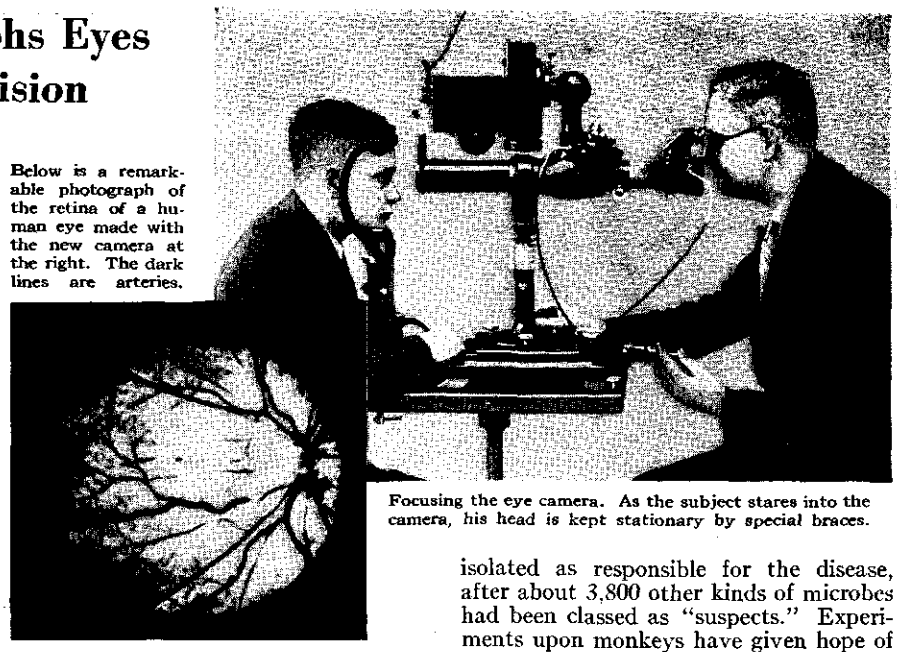
[illegible]e hot, wind-swept desert.

New Camera Photographs Eyes to Find Secrets of Vision

SECRETS of vision that lie within the retina of the human eye on which, day after day, millions of pictures are photographed successively, are now being investigated by means of a new camera perfected at the famous Zeiss optical works at Jena, Germany.

The new Nordenson camera, sliding up and down on its stem, may be adjusted to any height necessary to focus the eyeballs of the subject to be photographed. The subject sits in a chair at one side of a stand on which the apparatus rests, with his chin resting on a padded support from which an arm rises to encircle his face, thus insuring immobility and a standard position for taking the photograph.

At the other side of the camera, the operator looks through an eyepiece and manipulates the adjusting screws of the camera until the retina to be taken is in perfect focus. The subject stares into a tubular hood at the front of the camera and while his eye is functioning normally, the photograph is made with an exposure of only one twentieth of a second.



Below is a remarkable photograph of the retina of a human eye made with the new camera at the right. The dark lines are arteries.

Focusing the eye camera. As the subject stares into the camera, his head is kept stationary by special braces.

Foresees Electric Heat from "Coke Batteries"

GIANT electric batteries, consuming coke and air and yielding electricity cheaply enough to revolutionize house heating and other branches of practical engineering, are suggested as possibilities by Professor M. deKay Thompson of the Massachusetts Institute of Technology.

To heat a house or to generate electricity at present, Professor Thompson says, coal, coke, or some other fuel must be burned in a furnace or under a steam boiler. This is always a wasteful process. Theoretically, he points out, the carbon of the coke might combine directly with the oxygen of the air in a special electric battery, yielding electricity, just as happens when metallic zinc and the solution of chemicals combine in the ordinary dry battery. Such a coke battery might be so efficient as to utilize nearly all the energy of the coke instead of the fourth or less of it that is turned into electricity by ordinary methods.

Coke batteries have been constructed, Professor Thompson states, but they work too slowly for practical use. Some possibilities exist, he suggests, of escaping this handicap if inventors can devise suitable solutions and equipment.

Evidence of Nerve System Found in Plants

PERHAPS plants have nervous systems and hereafter may be treated by neurologists. In experiments with the large cells of the water plant Nitella, Dr. W. J. V. Osterhout, of the Rockefeller Institute, has found evidence of nerve currents similar to those of animal muscle and nerve. His experiments were conducted with the aid of an ingenious electrical apparatus which was able to detect minute electrical variations within the cells of the plant.

Discovery of "Flu" Germ Awaits Confirmation

A GERM that looks under the microscope like a string of pearls is probably the thing that gives people the "flu," according to Dr. Isadore S. Falk, University of Chicago bacteriologist. He reports that he has isolated the long-sought cause of influenza, and that experiments are already under way to develop vaccines and antitoxins to prevent and cure the disease.

The germs, to which only the laboratory name of "42X" has thus far been given, colonize in clumps. Some of them are rough, some smooth. The rough type is the more virulent, Dr. Falk believes; the smooth ones may be responsible for common colds and sore throats.

Announcement of Dr. Falk's discovery follows a year of work, in which he and thirteen assistants were stricken with influenza. A young woman among these furnished the germs that were finally isolated as responsible for the disease, after about 3,800 other kinds of microbes had been classed as "suspects." Experiments upon monkeys have given hope of immunizing against influenza, and tests upon human beings are scheduled.

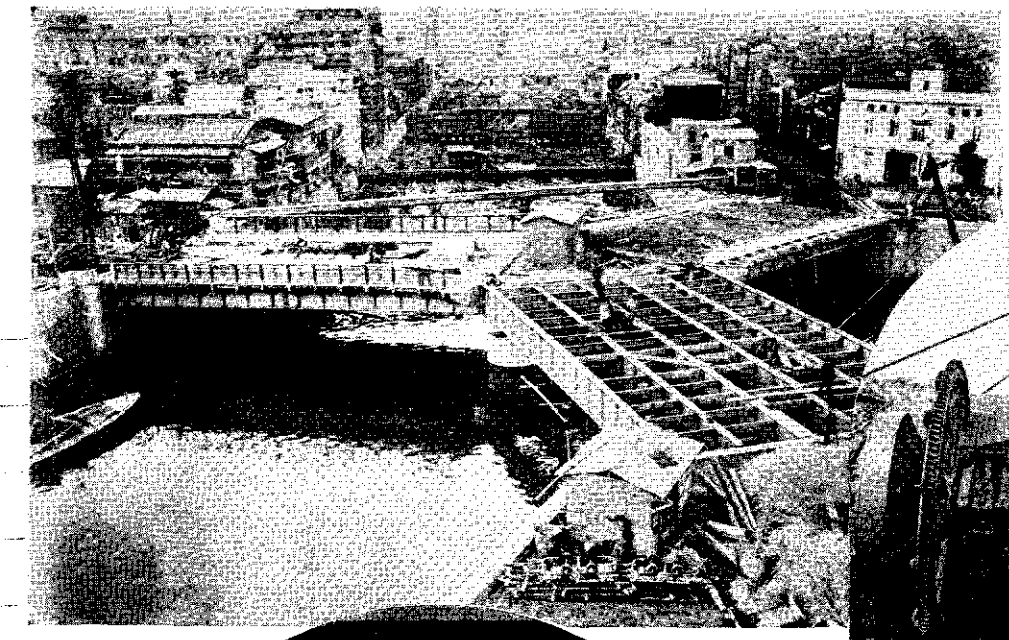
Dr. Isadore S. Falk, University of Chicago, who reports discovery of the influenza germ.

Meanwhile, caution in accepting the results is advised by the American Medical Association, pending confirmation by others in the same field. This is at least the tenth time in five years, it points out, that discovery of the "flu" germ has been announced. Today specific treatment for influenza remains an indefinite future prospect. Such experiments as Dr. Falk's are always difficult to interpret, it says, although his work is "of great interest."

How Much Do You Know About Mechanics?

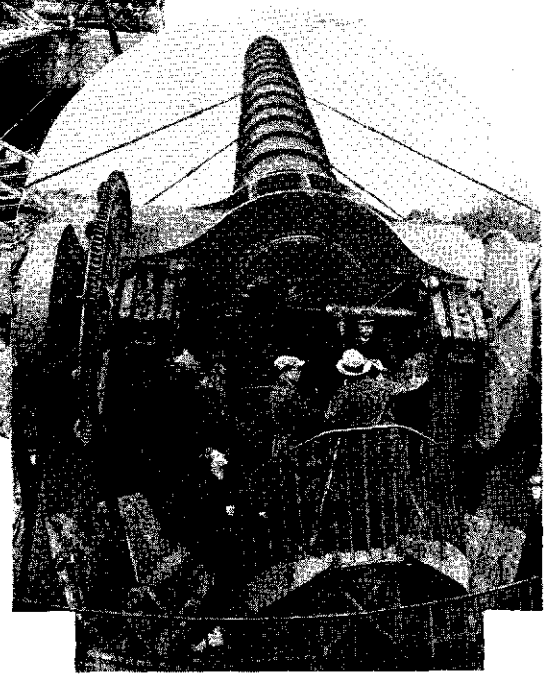
TEST your knowledge with these questions, chosen from hundreds asked by our readers. Answers appear on page 155.

1. **Why is it necessary to prime a pump?**
2. **Which is more powerful—an electric locomotive or a steam locomotive?**
3. **How would you compute the horsepower that can be developed by a waterfall?**
4. **How can two electric motors of different sizes develop the same power?**
5. **Why is a vacuum needed to run a steam engine?**
6. **How is it possible for a man to lift a heavy weight with a chain block?**
7. **What makes the draft up a chimney?**
8. **If you double the power in a motor boat will it go twice as fast?**
9. **What causes the hammering noise in a water pipe when you shut off the water suddenly?**

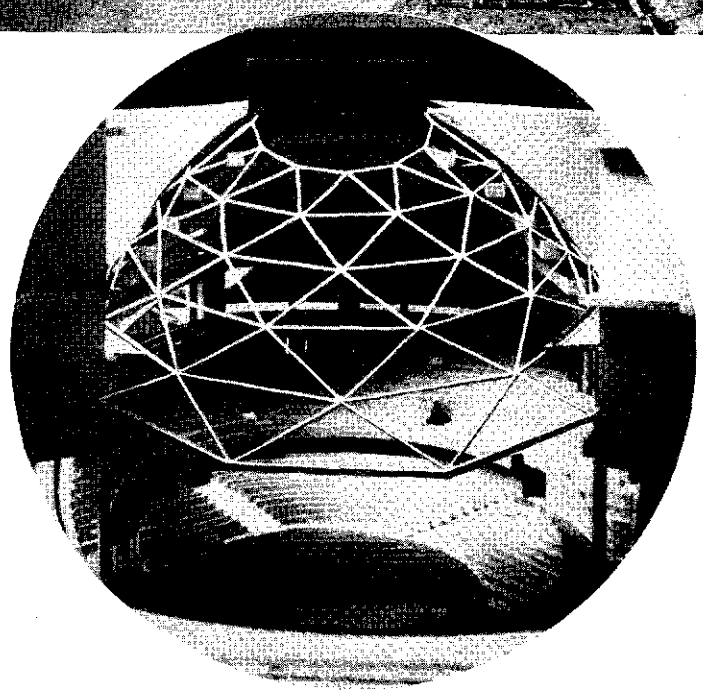


Japan's Three-Way Bridge

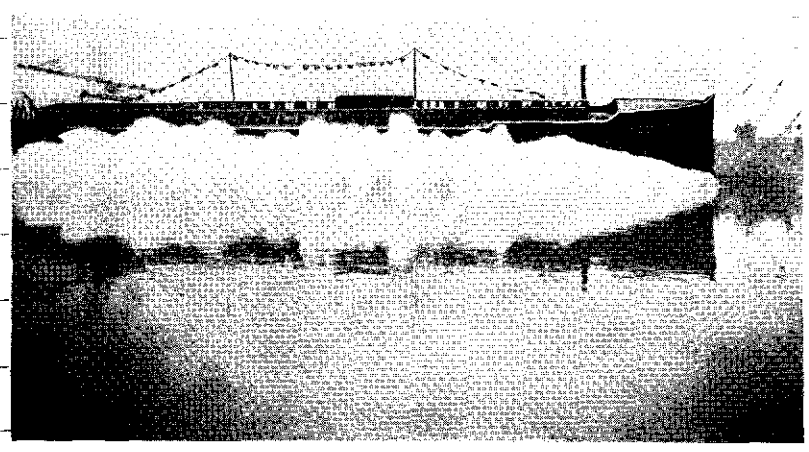
The unusual triple-span bridge pictured under construction at the left is an attempt of Japanese engineers to relieve traffic congestion across a junction of waterways at Kyobashi, the industrial center of Tokio.



A "Big Bertha" of Astronomy. Pointing like a mid-war Krupp gun at the glowing heavens, this new telescope is being used by astronomers at the Observatory of Treptow, Germany, for observation of the sun.



"Theater of the Future." That theater auditoriums soon will be patterned after ancient Greek amphitheaters is the prediction of a German architect, who has embodied his ideas in the model shown above. The domed roof has been skeletonized to show the interior.



Umbrellas Sold by Slot Machine

If caught in the rain, Berlin pedestrians now can deposit the equivalent of fifteen cents in a vending machine and pull out an umbrella. The folding emergency umbrella comprises a hood of oiled paper and a handle of wood.

First Electric Car Ferry

The photo at the left shows the launching of the *Saginaw 31*, first of a fleet of turbo-electric driven car ferryboats for Great Lakes traffic. Each can carry thirty eighty-ton railway freight cars.

Steam Shovel Heralds Building Revival

—Photo by Lee Krupnick, World Bldg.

For the first time in several months a steam shovel has been busy at work in the downtown business section of Tulsa. Excavation for the new three-story business building which Waite Phillips is constructing on the 50-foot lot adjoining the Philcade building on the south will be completed this week.

The above photograph shows a section of the Philcade building and across the street the Thompson building. The new structure will cost about $50,000.

place was about 1,000 miles south-
east of Jerusalem.

tured by tribesmen or died from
thirst in the hot, wind-swept desert.

GERMICIDE DIET FOUND BY MAYOS

New Treatment Lets Body Form Chemicals for Killing Germs

HOWARD W. BLAKESLEE
Associated Press Science Editor.

ST. PETERSBURG, Fla., March 28 (AP)—Discovery at the Mayo clinic of a diet which the human body uses to manufacture its own germ-killing chemicals was reported to the American Chemical society today by A. E. Osterberg, M. D.

These "home-made" germicides act the same as healing drugs but are more effective because they originate within the body, where it is difficult to reach with medicines.

These particular diet germicides limit their healing action so far as now known to one tract of the body. They begin work in the system which starts with the kidneys and extends down through the bladder.

Human Germicides.

The human germicides which work there are known chemically as ketones. They are acids, all of them produced normally from the fat in food during digestion. These acids gather in the "sag" of the kidneys. The Mayo discovery is a balanced diet which will produce them in large quantities for patients suffering with infection in this body tract. The diet proportions are 140 grams of fat, 25 of protein and 15 of sugar. The fat may come from butter, cream, lard and oils. The protein part of a meal is so low that almost no meat should be eaten, nor leguminous vegetables like peas. The sugar, or carbohydrate fraction is still lower ,and means cutting out all starchy foods. This results in an overproduction of the three ketonic substances, known as acetone, diacetic acid and beta-oxybutyric acid. The last named, Doctor Osterberg said, is the germicide which kills the bacteria.

The Mayo clinic has found also a simple test which shows when a patient's diet has reached the right balance for doing his own internal disinfection. As the ketones are excreted from the body they reveal their germ-killing concentration by turning the color of a special kind of paper from yellow to red.

Cancer Work Reported.

Memorial hospital in New York City has tried out the new heavy water on cancer, and found that it apparently has not the least curative effect. High hopes had been held that the double-weight hydrogen in heavy water might slow down cancer growth.

The report of the cancer trials was delivered to a heavy water symposium by Dr. Harold C. Urey of Columbia university. He said also that the Memorial hospital physicians found heavy water nonpoisonous to growth of wheat seedlings. Earlier experiments of other scientists had indicated that plants and animals do not live in this water.

Doctor Urey suggested that chemical impurities in the heavy water may explain some of its previously reported lethal effects. There is so little heavy water available that it has been difficult to clean out the impurities and still have enough of the water left for experiment.

Discovery of the reason why the copper eaten in the sea food is harmless to human beings was reported by E. Jack Coulson of the United States bureau of fisheries and Roe E. Remington of the Medical College of South Carolina. The sea dwellers, such as oysters, convert the ocean copper into "closely-bound" state. In the digestive organs this sea copper won't crack open so that the body can absorb it, but mostly passes out as waste. Ordinary copper is assimilated and poisonous.

FINDS RELICS WITH MAGNET

UNIONTOWN, Pa. (LP)—Numerous relics of the ill-fated Braddock expedition, which was destroyed by Indians near here nearly two centuries ago, have been found by use of a "magnetic balancer," which detects the presence of metal in the ground.

place was about 1,000 miles southeast of Jerusalem.

tured by tribesmen or died from thirst in the hot, wind-swept desert.

EXPLORER TELLS OF SHEBA'S CITY

Famous Capital in the Valley of Kings Expected to Be Rich Find

PARIS, March 23 (AP)—The capitol of Sheba's fabulous queen cast off its centuries-old covering of sand and was endowed with life again today by the words of Andre Malraux, French explorer, author, and archaeologist.

With his pilot, Captain Corniglion Molinier, Malraux flew over the wastes of the Arabian desert and identified as the city of Naith a cluster of ruined towers and temples.

He exhibited aerial photographs as evidence that he had discovered the queen of Sheba's long-lost city, low half buried in sand and apparently guarded by fierce Arab nomads.

The lost metropolis, called Naith by roaming Arab story-tellers, is situated, roughly, about 100 miles northeast of Mareb, which long was regarded as the seat of the Sheban kingdom.

Naith Real Capitol.

Malraux believes, in view of the much greater size of Naith's mile-square citadel, that it was the real capital of the romantic queen's domain, while Mareb and Mein—the latter is about 40 miles west of Naith—were only provincial administrative centers.

"The Arab nomads who fired upon our plane when we flew over the city must be driven off before exploration will be possible," Malraux said.

"Further research much await British pacification of the region."

"It was a fantastic vision," said the captain in recounting his impressions of the ruins they saw on March 8.

"Think how many dreamed of seeing the fairy city which seemed so impossible to discover that it had become a legend rather than a reality.

"We left Djibouti—in French Somaliland—crossed the Red sea, and flew over Yemen.

"We encountered a sandstorm that raged five and a half hours, but nevertheless continued.

Thousands of Tombs.

"Soon we saw thousands of tombs that dot the valley of kings. Finally, at the edge of the great Ruba-el-Khali desert, an extraordinary white city loomed up on the dark heights streaked with ancient streams of lava.

"We were above the city of the Quen of Sheba—a storied capital abandoned centuries ago and probably visited only from time to time by wandering Bedouins, some of whom we saw.

"These Bedouins gave us a bad reception. We were greeted with rifle shots. There could be no thought of landing. Besides, the ground was rough and it would have been impossible for an airplane to alight.

"Our flight lasted nine hours, so we returned to Djibouti the same day."

Malraux said that until the desert is explored the exact location can not be fixed, but that explorers could mark the site by measuring the number of miles from a given starting point. Earlier he said the place was about 1,000 miles southeast of Jerusalem.

DOUBT RUINS ARE OF SHEBA'S CITY

Discovery May Prove Even More Interesting, Declares Scientist

PARIS, March 10 (AP)—A possibility that the "20 towers or temples" two explorers identified as remains of the Queen of Sheba's fabulous capital may be another, even more interesting, city was seen today by an eminent French authority on Arabia.

"Sheba's kingdom and its capital already have been discovered and have been known for many years to have existed in the southern part of Arabia," said Rene Dussaud, curator of oriental antiquities in the Louvre museum.

"Andre Malraux may have found something else intensely interesting —more interesting than the city of Sheba, about whom many fairy tales and legends have been woven."

Photograph Ruins.

Malraux and Capt. Corniglion Molinier, who reported to the French air minister that they had flown over and photographed the sand-covered vestiges of the mysterious Sheba's headquarters on the northern edge of the great Arabian desert, prepared, meanwhile, to return to the p'ace.

Knowing that death might be the cost of their hazardous adventure, but also that their reported discovery was of paramount importance to archaeology, the author-student and pilot made their plane ready once more at Djibouti, French Somaliland, for another flight to the area, about 1,000 miles southeast of Jerusalem.

But this time they plan to land nearby and explore the mounds and valleys they believe hold the secret of Sheba's land and further details of ancient civilization. Should anything go wrong in this daring project they know it might cost them their lives—at the hands of fierce tribes in the district, or through thirst and starvation.

Await Further Word.

If they are successful in their 900-mile trip over the trackless desert they will throw light on a problem scholars have studied 2,000 years.

French archaeologists, meanwhile, awaited further word from them, although some orientologists expressed doubt that Malraux and Molinier had really found the Queen of Sheba's city.

Any vestiges of ancient civilization in the savage desert of southern Arabia, they said, is of utmost importance to those interested in ancient lore, since the region is one of the last really unexplored spots in the world. It is almost unknown to white men because of the hostility of Arabian tribes as well as the barrenness of the region.

Give No Details.

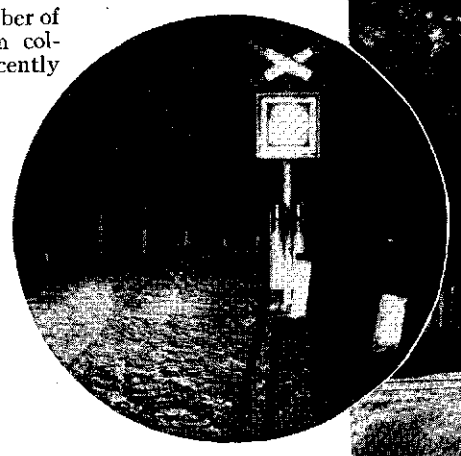
In their first message to the ministry the explorers did not give details of the city's location. Experts here believe it might be in the region of Naith, which, they claim, would be more in keeping with old descriptions.

Many lives have been lost in trying to find the place. Four Europeans got to Mein, Liyr, and Mareb —mentioned as possible sites—but other expeditions have been captured by tribesmen or died from thirst in the hot, wind-swept desert.

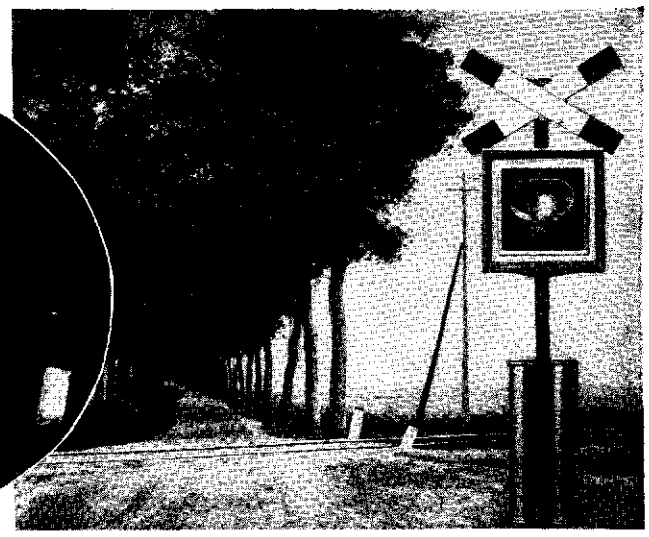
New Grade Crossing Signal Light

TO REDUCE the increasing number of fatalities from automobile-train collisions, the German government recently introduced special railway signal lights for automobile drivers at grade crossings. White and red are the colors used, corresponding to the green and red lights ordinarily used for railroad signals.

When the track is clear, a continuously-blinking white light informs the motorist that he may cross, giving a positive assurance of safety. An approaching train makes an electric contact that changes the light to a red flash signaling "danger." Concentrated by a screen, the light is plainly visible by day and night.



The crossing signal at night. Its brilliant white light changes to red when a train approaches.



A daytime view of the new warning signal installed at a grade crossing in Germany. It contains powerful lamps and reflector.

Steam Heated Gardens

UNDERGROUND steam heating plants may be the next item on the list of agricultural implements. Heating the soil has been found by an English chemist, Dr. W. F. Bewley, Director of the Experimental and Research Station at Cheshunt, to destroy pests and diseases and to increase soil fertility. The method involves heating the soil for about half an hour at the temperature of boiling water. Heavy soils require more heating than light, sandy soils. Disease-producing bacteria and fungi are said to be destroyed without killing the beneficial soil bacteria. The heat also breaks down complex chemicals into simpler ones useful for the soil bacteria.

Heating must be thorough, says Dr. Bewley, and is best carried out by running a current of steam through the soil. Baking is all right but dangerous, as overbaking leaves the soil dry and ruins it.

Advocates Flying Clinics for Frayed Nerves

"AIR CLINICS" for nervous and run-down patients are suggested by C. L. Julliot, French lawyer. With the reported approval of the medical faculties of France, he proposes airplane rides as a tonic for the nerves. Every hospital might maintain an airplane or two for the use of its patients.

Physiologists have long known that brief visits to the tops of habitable mountains cause changes in the human body, particularly in the blood. However, there is little quantitative data as to the proper "dosage" of high-altitude exposure, or the exact effects it produces upon human beings.

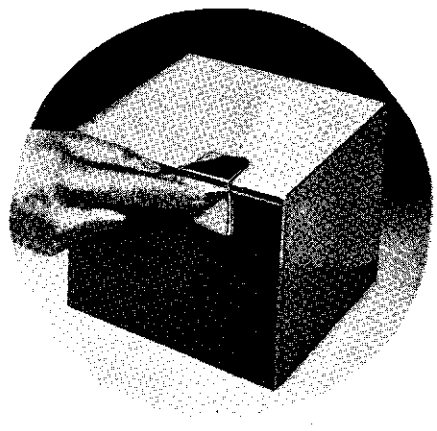
Aside from high peaks, there are only a few places in the United States where such tests could be made. The United States Bureau of Standards at Washington, D. C., has an "altitude chamber" in which it now tests the effect of high altitude upon motors. Another place where upper-level effects could be duplicated is the remarkable globe-shaped hospital at Cleveland, O., where diabetic patients now can live in an atmosphere of more than normal pressure. Here powerful vacuum pumps could as easily maintain a pressure below that of the atmosphere.

When the exact effect of such treatment upon the human body is known, "flying clinics" may provide this tonic of the upper air and add the zest and thrill of aviation. Not only airplanes, but dirigibles of large passenger capacity might be fitted to fill any doctor's prescription for "high living."

Found—Easy Way to Open a Cardboard Carton

A HANDY tool for slashing open a cardboard or fiber carton with a straight line cut, so that the container may be used again, is the recent product of a New York City manufacturer. Simple and speedy in operation, it can be used to open either small packages in the home or large shipping boxes in stores and other business houses.

The tool consists of a handle with spreading wings at one end, between which is inserted a blade, not unlike a razor blade, that is held secure by a spring. The wings of the handle are set at right angles to each other, so that they fit over the edge of the carton to be cut and guide the blade in a straight line. When a blade is to be inserted, one of the wing flaps is raised, revealing the spring. The blade is inserted beneath the spring, the flap is shut down and locked in place, and the tool is ready for work.



Sliding the razor-bladed tool along the rim cuts off the lid without damaging the carton.

Ship-to-Shore Telephone Service Opened

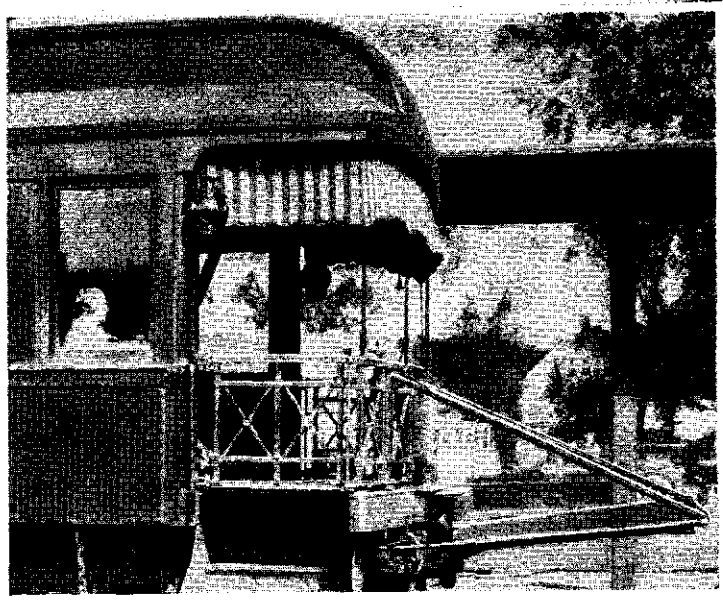
THE first "ship-to-shore" telephone service by radio was opened on a recent eastbound voyage of the steamship *Leviathan*. Seated at his desk in the offices of the American Telephone and Telegraph Company on Broadway, New York City, Walter S. Gifford, President, took up the phone and asked for "the United States Liner *Leviathan*, somewhere at sea." His voice was carried through a new transmitting station at Deal Beach, N. J., thence to a station at Forked River in the same state, and finally reached the radiophone receiver of the great liner 200 miles out on the Atlantic.

Other calls were put through from New York, Washington, D. C., Atlantic City, N. J., Indianapolis, Ind., and several other cities at the rate of seven dollars a minute.

With good weather conditions it is claimed that the *Leviathan* should be able to establish phone contact with the shore at a range of 1,500 miles. Telephone officials say that the vessel will offer twenty-four-hour phone service whenever it is within range of American transmitting service. President Gifford predicts that eventually every ship on the seas will be linked by radio to the shore and thence by wire to any telephone.

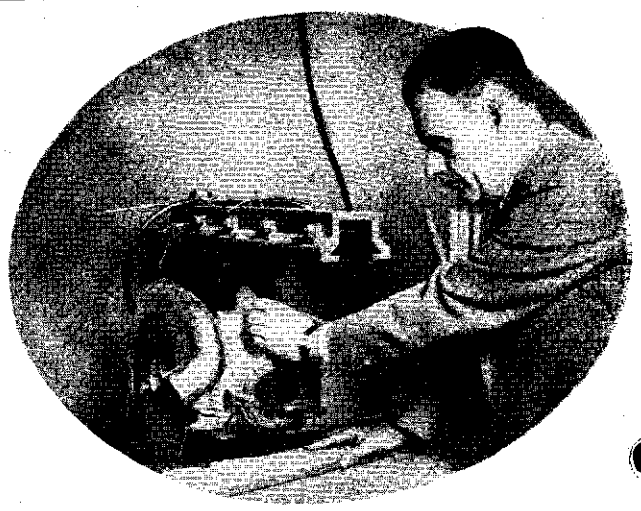
Speedway Atop a Railroad

ABOVE the twenty-six-mile stretch of the Grand Trunk Railway running from Detroit to Pontiac, Mich., a four-way automobile toll road mounted on steel pillars will be built. This is said to be the first instance in which the air rights of a railway have been used for automobile traffic speedway purposes in the United States. The speedway will enable the motorist to cover the twenty-six-mile distance easily in thirty minutes. It will pass over all intersecting streets and railroads, will be encumbered by no traffic lights, and will be zoned. Traffic will enter and leave by way of ramps built at important intersections. The first step in the construction of the roadway will be the electrification of the railway underneath at a cost of $100,000,000.

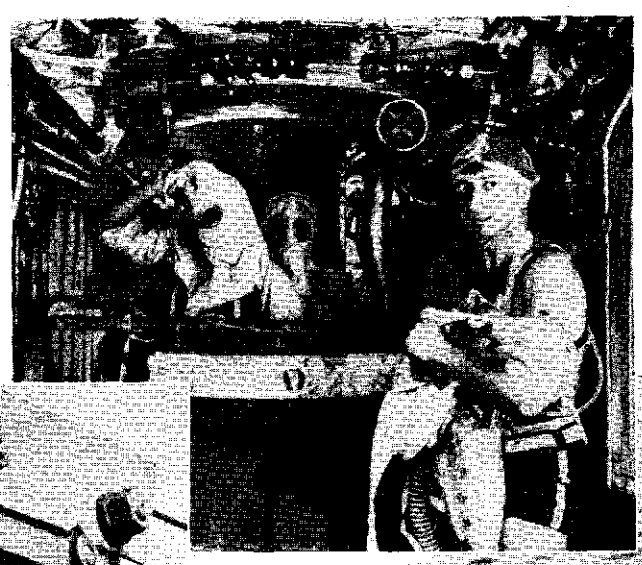


Dust Catcher

Passengers on crack trains of the Dominion Atlantic Railway in Nova Scotia can sit on observation platforms without being choked by swirling dust. A new dust catcher consists of a rectangular frame of iron pipe covered with a screen of canvas and attached horizontally to the end of the observation car a foot below the floor level. Of light construction, it can be detached easily and quickly for cleaning.

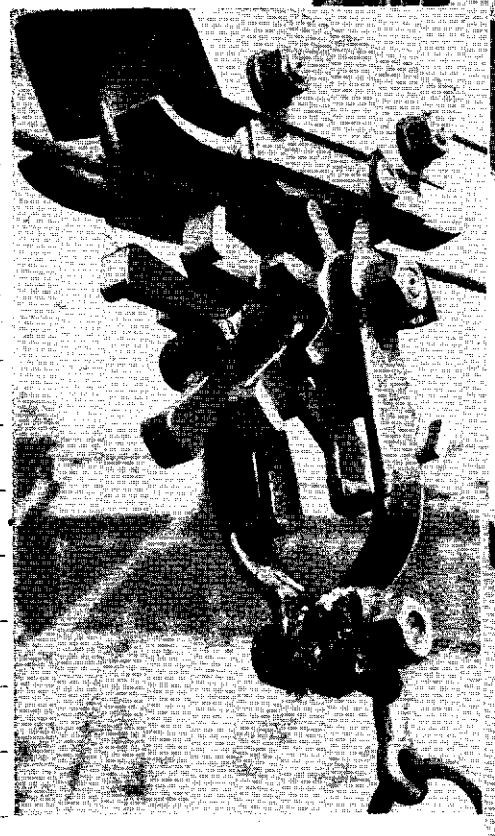


An All-Purpose Saw By changing blades, this new adjustable saw can be used to cut stone, iron, steel, or fiber, as well as wood. It also will cut at any desired angle, or make circular grooves. The circular blade is attached to an arm which moves on ball bearings.



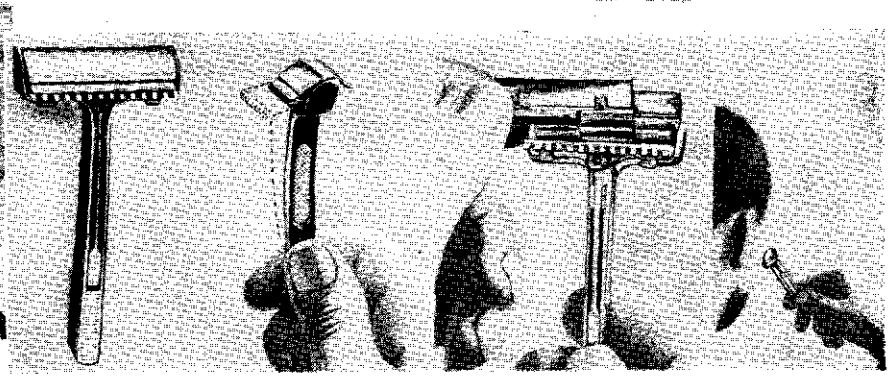
Submarine Rescue Tube

Sixty-five feet undersea, the crew of the Italian submarine *S-17*, in recent tests near Spezia, Italy, entered a newly invented safety tube and shot to the surface in six minutes. At sixteen feet depth, others of the crew escaped wearing only bathing suits. The tube leads to an escape reservoir on the submarine, where water is held back by air pressure. At left: Donning diving suits for escape from the submarine. Below: The members of the submarine's crew reaching the surface.

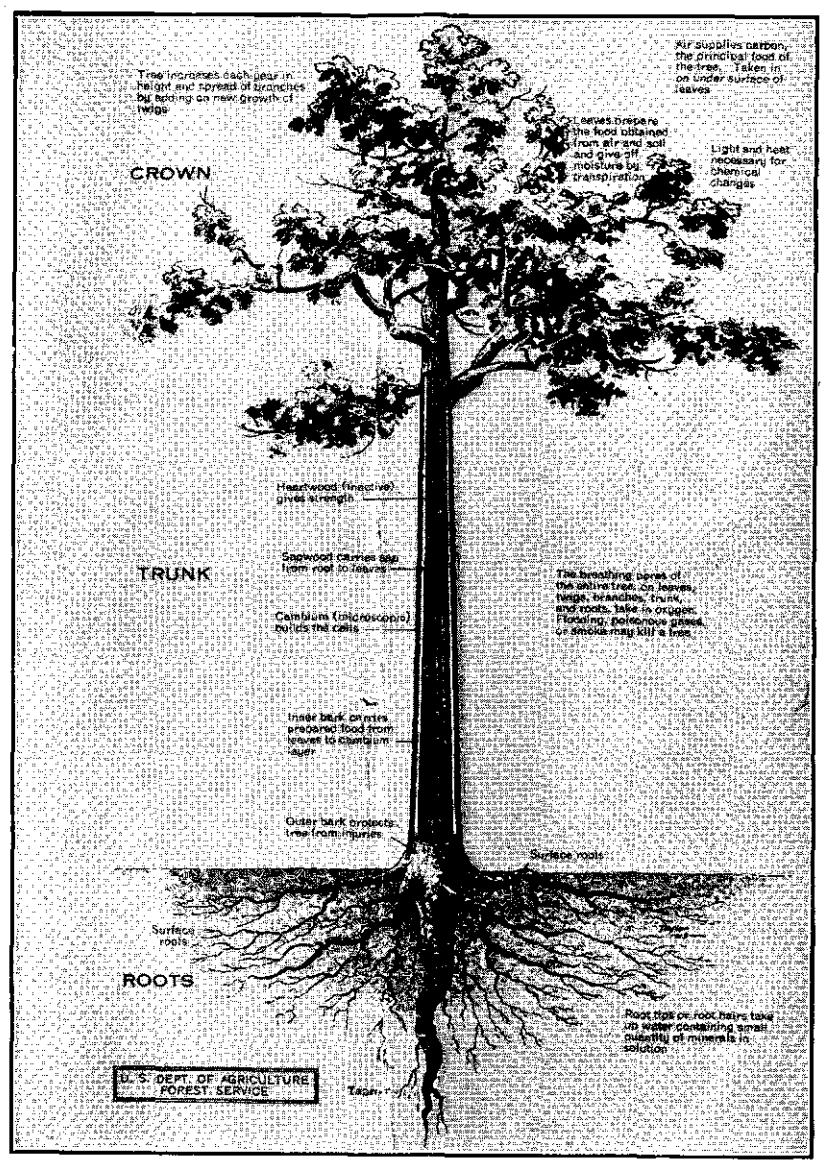


A "Step-Over" Trolley

Moving metal "fingers" that suspend the load from this new cableway trolley are said to lift a five-ton load over crosswise cable supports, thus solving satisfactorily an "impossible" problem.



Self-Sharpening Razor All the shaver need do to keep a keen edge on this novel razor, the inventor claims, is to shake it once in a while; for it combines in one unit a blade, a hone, and a strop. The shaking is said to move the blade edge over a sharpening surface to which a special chemical abrasive has been applied. These views show the new safety razor and its self-sharpening mechanism.



HOW THE TREE GROWS

The buds, root-tips, and cambium layer are the growing parts of the tree. Water containing a small amount of minerals in solution is absorbed by the roots, carried up through the sapwood to the leaves and there combined with carbon from the air to make food. This food is carried by the inner bark to all growing parts of the tree, even down to the root-tips.

Airplane Helps Make New Flower

Continents Are Spanned to Speed Cultivation of Double Nasturtium

By JOHN SELBY

NEW YORK, March 24 (AP)—The result is a million seeds of a new "poor man's flower"—double nasturtiums that look like azaleas and range in color from lemon yellow to scarlet.

But the process which was helped by the airplane was complicated. It began last summer when a man who owns 500 acres of flowers in California ordered his superintendent to make 50,000 crosses on a Spanish double nasturtium which up to that time could be had only in one color.

The gardener thought his boss was crazy. But he hurried back to the farm, engaged a hundred Japanese women, and set them to the delicate work of making the crosses. Each plant thus treated had to be wrapped in a cheesecloth hood to keep the bees from messing things up. There was time for only 40,000 crosses.

Enter Mathematics.

Then mathematics entered. Each nasturtium has only three seeds. In September, there were 120,000 seeds. It requires three generations to "fix" a sport. The expert (whose name is David Burpee) couldn't wait three seasons. So the seeds were flown by airmail to Philadelphia where acres of greenhouses were cleaned out, and the lot planted. In December that crop was harvested.

Then there were 360,000 seeds. There also was the ever-present possibility of crop failure. The eager owner of 360,000 prospective varicolored nasturtiums took no chances. It cost $49 to send two pounds of the seeds to Buenos Aires. Another lot went by air mail and fast ship to Australia. Others were flown to Florida and Puerto Rico, and the Philadelphia greenhouses were filled once more.

Millions on Way.

Blooms are being shown in the prominent flower shows this month. In a few weeks there should be more than a million seeds—and that is where the increasing number of people with leisure for gardening come in. Three years' work will have been completed in 11 months.

Nasturtiums were, Mr. Burpee believes, the ideal flower on which to work such a trick, because they will, he says, grow anywhere. Other flowers, such as sweet peas, require expert care. Incidentally, Mr. Burpee's father is said to have paid one of the record prices for seeds in quantity, 20 years ago.

The elder Burpee saw a new red sweet pea at the London flower show. There were exactly three ounces (which is quite a good many sweet pea seeds) of this particular seed in the world. Burpee pere paid $1.39 for each seed.

George Washington, Inventor

WASHINGTON WAS A MAN OF AMAZING versatility. In the field of invention he achieved the same notable success that characterized his activity in many other lines of endeavor.

Writing in *The Scientific American* (New York), James Hay, Jr., justifies this preliminary pronouncement. Washington, he says, had little patience with poor workmen or crude implements. When, at the age of twenty-one, he began farming at Mount Vernon, the agricultural machinery at his disposal was cumbersome, heavy, and inadequate. As the years went by, and while he was increasing his home estate from its original 2,700 acres to more than 8,000, he invented and developed several pieces of farm machinery. We read further:

"Beginning his first venture in inventing farm tools, he took his blacksmith with him to a neighboring field, whither he had already sent a pair of his carriage horses. With the smith's help, he put together parts of a 'two-eyed plow' with other parts of a 'duck-bill plow' and tried out the result behind the carriage horses.

"They kept at it, and a week later Washington wrote in his diary: 'Spent the greater part of the day in making a new plow of my own invention.' On the day following this, he recorded that he had put the plow to work 'and found it answered very well.'"

His most important invention, however, and the one in which he took the most pride, was what he called a "barrel plow," altho it was in fact a drill, the result of his determination to improve on the old method of sowing. Says Mr. Hay:

"This drill consisted of 'a barrel or hollow cylinder of wood mounted upon a wheeled plow and so arranged that as the plow moved forward the barrel turned. In the barrel were cut or burned holes through which the corn or other seed could drop into tubes that ran to the ground. By decreasing or increasing the number of holes, the grain could be planted at intervals that could be varied as desired.'

"Behind the drills ran a light harrow or drag which covered the seed, tho in rough ground it was necessary to have a man follow after with a hoe.

"After thoroughly testing the machine, the inventor in a letter to a friend declared that it would 'not work to good effect in land that is very full either of stumps, stones, or large clods; but in light land I am certain you will find it equal to your most sanguine expectation. I have sown oats very well with it, which is among the most inconvenient and unfit grains for this machine.'

"Washington had pronounced talent for architecture. He planned and drew up the specifications for all the barns and other farm buildings which he erected on his estate, for additions to the Mount Vernon Mansion, and for old Pohick Church.

"One of his accomplishments as an architect was his sixteen-sided barn, a brick structure which a neighbor of his described as 'the best and most conveniently arranged barn on this side of the Atlantic Ocean.' In his era the threshing of wheat was done by throwing it on a hard surface, usually out-of-doors, and having the grain trodden out by the feet of slaves or the hoofs of horses. This was immensely costly because it destroyed some of the grain and mixed the remainder with dirt and trash.

"Consequently, in his sixteen-sided barn, Washington included a specially designed threshing floor, containing cracks through which the grain, when trodden out, dropt down to a perfectly clean surface."

In 1790, while in New York, he drove out in the country to watch the operation of "Baron Poelnitz's mill," a threshing machine which was run by two men and threshed two bushels of wheat an hour. The grain had to be winnowed afterward to get rid of the chaff:

"The mechanism so little impressed Washington that he had no desire to buy one for Mount Vernon.

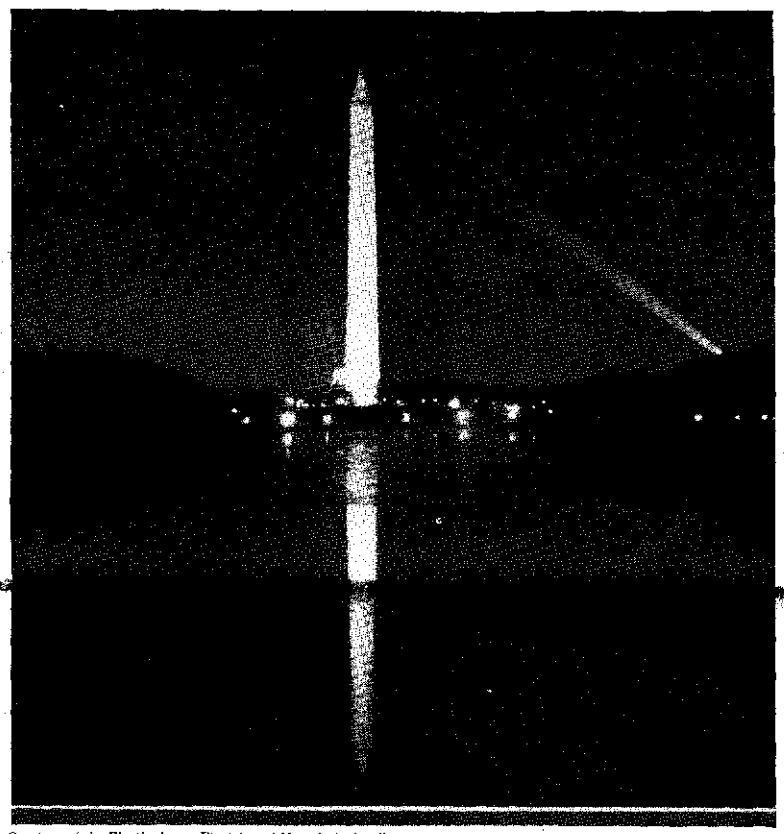
"It was a different story seven years later when, having studied the plans of a thresher invented by the American, William Booker, he employed that gentleman to come to Mount Vernon and set up the machine. But again he was disappointed. The following April, in 1798, he wrote Booker that the thresher 'has by no means answered your expectations or mine.'

"Nevertheless, not long after the Booker failure the farmer had two threshing machines on his plantation, which combined the best points of all such mechanisms that Washington knew about. He had corresponded with both English and French agriculturalists about the latest types of threshers, and he had once used his inventive faculty to good effect.

"Washington had, in fact, the scientific mind, which is amply proved by the voluminous notes he left describing the results he obtained in experimenting with rotation of crops and his use of different combinations of soils and fertilizers. Nor did his scientific interest cease with his own activities.

"When James Rumsey, a noted engineer, developed a steamboat, Washington helped him in every way possible. In fact, it was through letters of introduction given by Washington that Rumsey interested Englishmen in his vessel, and made a successful demonstration of it on the River Thames near London.

"Altho Rumsey never developed his boat into a practical business proposition, he undoubtedly invented the steamboat years before Fulton sailed the *Clermont* on the Hudson; and it was largely due to Washington's friendship and assistance that he got as far with the project as he did."



Courtesy of the Westinghouse Electric and Manufacturing Company

The Washington Monument Flood-Lighted

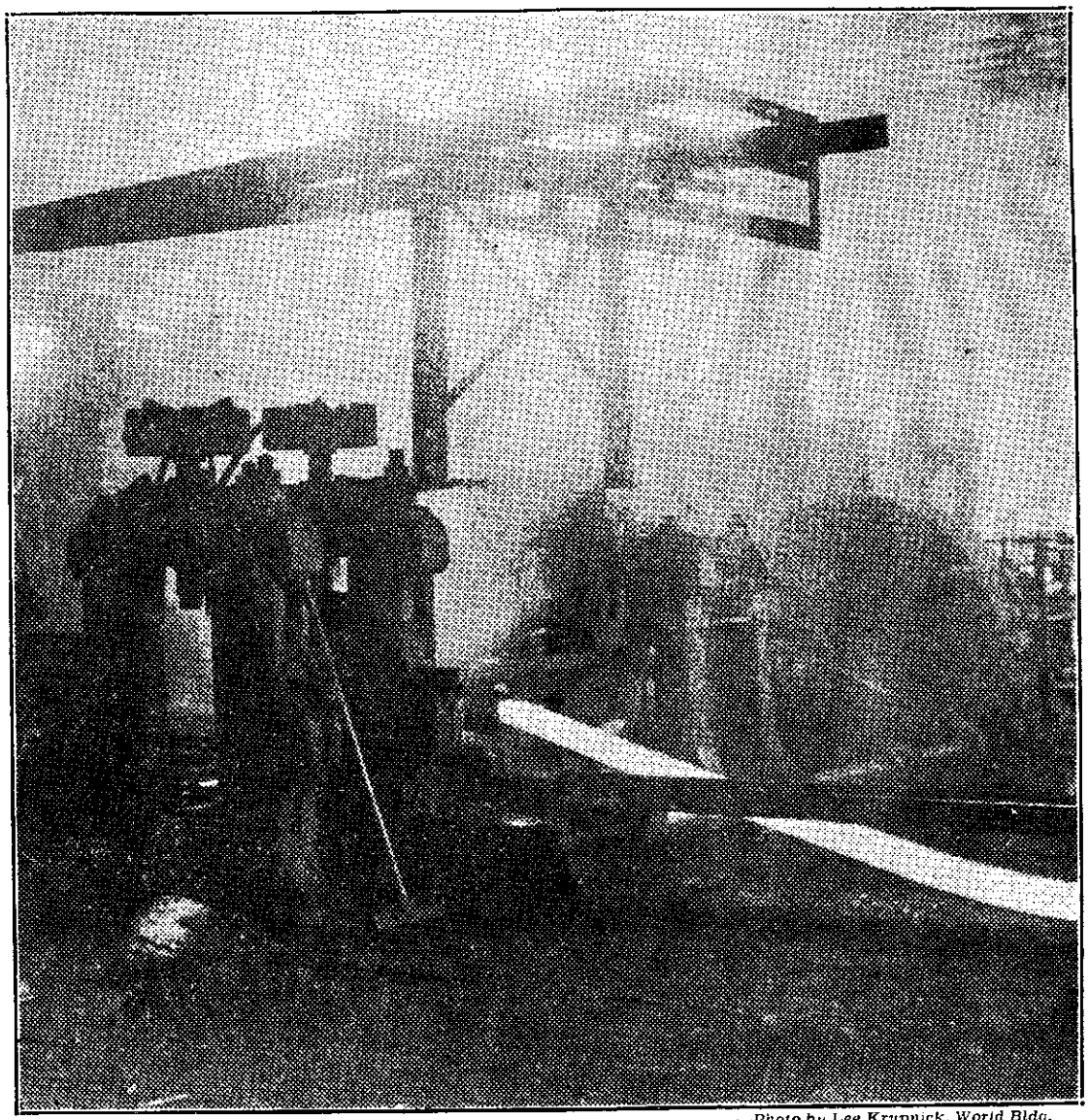
"Against the deep-blue night sky the nation's narrow needle pierces the heavens like a great white wedge."

The Washington Monument Flood-Lighted

ALL the impressive grandeur of the Monument has been multiplied many times by the new flood-light illumination, says a press bulletin issued by the Westinghouse Company's News Department (East Pittsburgh, Pa.). It goes on:

"The simple dignity of the straight shaft was imposing before the installation of the powerful lights. Even more splendid today is this solemn, slender obelisk, this magnificent memorial to a man who will always be the First Citizen of the United States. Against the deep-blue night sky the nation's narrow needle pierces the heavens like a great white wedge, and the striking color contrast compels observers to stop and remain silent for many minutes while they thrill with a new realization of its significance."

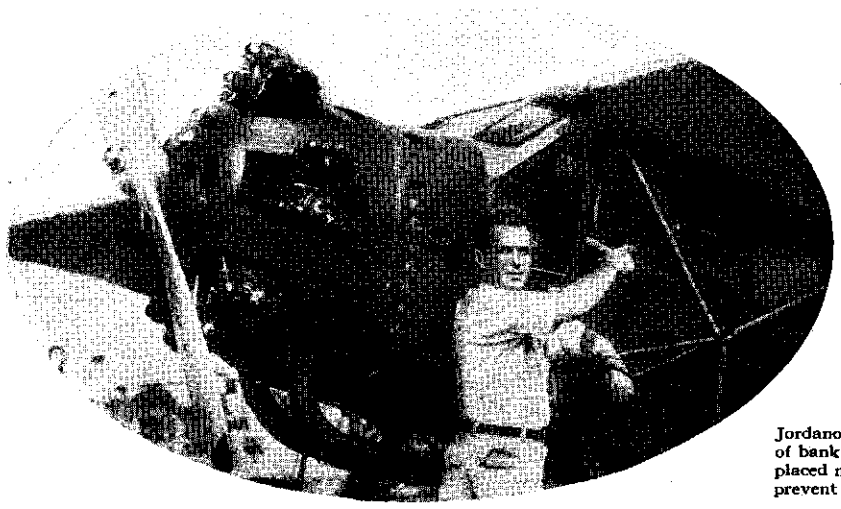
Here's First Tulsa Made Steel



—Photo by Lee Krupnick, World Bldg.

The first ribbon of molten steel to be poured from the open-hearth furnaces of the Tulsa steel mill at Sand Springs is vividly shown in the above picture under a background depicting intense heat. The mill started actual steel manufacture Friday night.

The initial output consisting of 150 tons were loaded on twin cars yesterday morning for shipment to Houston as a portion of a large contract. More than 200 men are employed at the plant.



Jordanoff points out how air tube of bank and turn indicator now is placed near engine for warmth, to prevent clogging by ice or snow.

Beating the Weather in the Air

What a Veteran Pilot Has Learned from Encounters with Storm and Fog During Sixteen Years of Flying

By ASSEN JORDANOFF

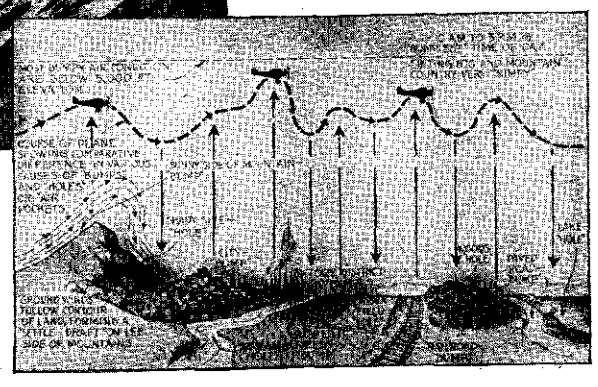
WHEN I think of flying weather at its worst, I think of a 9,000-foot plunge through darkness filled with ripping bullets of ice that I once experienced.

I was up with a photographer in a Bulgarian army plane during the war. We were ordered to take pictures of British movements behind the Saloniki lines. The sky was ugly. The ceiling was lower than the jagged cliffs of the neighboring mountains when we took off. At 10,000 feet, our Albatross nosed out into the sunshine. We saw shrapnel bursting in white puffs above the rolling layers of clouds. Gunners were aiming at us by the sound of the motor.

I dodged the gunfire, swerved into a saddle-shaped depression between two clouds, and—it happened. A gigantic down draft caught the ship and sucked it into the clouds. The stick jerked from my hand. The ship turned over and over, rearing and plunging as it fell. Completely out of control, it went down with screaming wires through clouds so black we could barely see a foot ahead of us. Rain and hail filled the darkness. The water struck as though shot from a fire hose and the white bullets of hail ripped along the fuselage and crashed against the wings.

Fighting for control of the ship, I crouched behind the windshield, at times plunging two miles a minute toward the crags below. We might strike and never see them. A queer thought flashed into my head. I wondered if I would know I was dead after we hit. Then a miracle happened. Like a cannon ball, the Albatross shot out of the clouds below the tops of the mountains. It was in a tight spiral, diving parallel to the mountain slope less than 100 feet away. Had it come out headed the other way, nothing could have saved us. The altimeter showed less than 1,000 feet when I got her leveled off. We had fallen nearly two miles. After I landed at the flying field, I found the trailing edge of one wing almost in shreds from the strain of the terrific dive and the pounding hail. Our faces were swollen and for days they were pitted, as though pock-marked, where the balls of ice had struck.

Around clouds there are always rising and falling air currents. A cloud is formed by a warm, moist current rising into cooler regions of the upper atmosphere. When a flyer passes under a large cloud on a hot day he gets a bump. Under all such clouds are strong rising currents. Glider flyers in Germany use them to soar for miles across country in a new sport they call "cloud flying." Starting from a hilltop, they glide to a place under a cloud and are carried upward by the column of rising air. Then they soar on to the next rising column, in this way progressing for long distances. Within the great mountainlike masses of a cumulus cloud, drifting in summer skies, there are rising currents under every "peak" and descending currents under every "valley." In passing through such a cloud, a ship is carried up and down like a roller coaster.



Above the lee slope of a mountain such as this a flyer often encounters a strong downward air current, or "settle-draft." The diagram at the right pictures the various sources of "bumps" in flying caused by rising currents of warm air, and of "holes" in the air produced by cool downward air currents.

DRY HOLE STILL PUZZLE TO OIL OPERATORS.

DALLAS, Tex., Mar. 23 (LP)—Despite revolutionary advances in the methods applied by petroleum geologists, the "dry hole" continues as a major bugaboo to the oil industry.

Many of the geologists assembled here today for the 19th annual meeting of the American Association of Petroleum Geologists doubt that a fool-proof oil detector ever will be developed.

Each year oil companies spend millions of dollars sinking test wells only to find worthless salt water.

However, due to constant study and research by scientists remarkable progress has been recorded in recent years toward a reduction of "dry hole" expenditures.

Most advanced of the intricate mechanical devices for exploratory purposes is the reflection seismograph.

By means of this delicate and mostly mechanism the expert now is able to send a series of electrical waves into the ground for several feet.

When the waves reach a solid bed or mass they rebound to the surface of the earth. The time it takes the waves to leave the ground surface, strike the bed, and return is recorded by the reflection seismograph.

On the basis of elapsed time the geologists are able to determine the depth to the bed.

Then by moving the device, Paul Weaver, Houston, geologist for the Gulf Production company explained, the experts can trace the entire course of the bed formation and its depth at any given point.

To find big deep masses, the geologists resort to magnetic equipment known as the magnetometer or dip needle. Other tests are made for density by means of devices the geologists call the gravimeter, torsion balance and the pendulum.

All of these are valuable aids in the finding of conditions conducive to the discovery of oil, but the oil itself still

(Continued on page seven)

Producers Wait

remains elusive enough to make oil exploration an extremely costly venture.

DALLAS, Tex., Mar. 23. (LP)—William B. Heroy of New York was to be elected president of the American Association of Petroleum Geologists today.

He was nominated without opposition, to succeed Frank R. Clark of Tulsa.

Heroy, association secretary for the last two years, is chief geologist of the Consolidated Oil Corporation of New York and has been connected with Harry F. Sinclair's corporation for 15 years.

Other unopposed nominations were M. G. Cheney, Anzac Oil company, Coleman, Tex., for secretary-treasurer, and L. C. Snider, New York City, editor.

The association conferred honorary memberships upon three leading geologists for service to their profession. They were M. R. Campbell of Washington, Geological Survey; Prof. Chas. Schuchert, Yale university, New Haven, Conn., and Joseph A. Taff of Los Angeles.

TUSLA, Okla., Mar. 23. (LP)—Development of new oil fields and impending introduction in congress of a measure to plug the legal loopholes in federal regulations for the industry held the interest of mid-continent oil men this week.

Definite determination of whether a wildcat well near Binger, in Caddo county, Okla., will open a new 40,000-acre field, as had been predicted was awaited.

The test was in an unknown sand at 9,972 feet. The well will be the deepest producer in the mid-continent area if it comes in. Failing to blow in when the master gates were opened yesterday bailing of the deep hole was completed last night.

It was shut down today to permit the well to clean itself out.

Oil men anxiously awaited definite word on whether the test will be a good producer or another "dud."

Meantime in Washington a bill was being prepared, under instructions of federal oil administrator Harold L. Ickes, to make the oil administration body a semi-permanent agency.

Authority for its orders will be derived from statutory acts rather than from NIRA as at present, Ickes said. The bill would forestall adverse court rulings, such as recently were handed down in Texas, by providing legislative authority for the oil administration's orders.

Inability of oil operators to reach an agreement on a pooling and marketing agreement for stabilizing prices was understood to have inspired Ickes to foster the legislative measure.

Action of the United States supreme court in agreeing to consider an appeal from a Texas federal court ruling which held invalid indictments against dependent operators for alleged violation of the code was praised by oil men.

Operaters had feared the Texas court decisions would open the way for uncontrolled production in the vast east Texas field; they hoped for an early ruling by the country's highest tribunal.

Another court test was instituted in Texas against a state law to permit the railroad commission to inspect refinery properties and records. The law was enacted in an effort to stop the running of "hot" oil in the east Texas field.

An order by the federal oil administration permitting an increase of 83,400 barrels in daily allowable oil production for the nation was greeted joyfully by oil men.

The spring seasonal pickup in demand permitted the increased flow.

Production of crude oil in the nation last week showed another sharp gain, with a large part of the increase being made in Oklahoma fields.

CHEMIST GIVEN SCIENCE AWARD

Dr. H. C. Sherman Wins Nichols Medal for Body Nutrition Work

Universal Service.

NEW YORK, March 10.—For enabling science to lengthen human life, through nutrition, beyond the destined limit of heridity life-span, Dr. Henry C. Sherman was awarded the 1934 William H. Nichols medal here.

This coveted recognition came to Doctor Sherman, famous Columbia university biochemist, one of the foremost investigators of vitamins, from the New York chapter of the American Chemical society. The medal was presented at the society's meeting at the Chemists' club.

Makes Statement.

In response to the complimentary summary of his life, personality and researches, made by Dr. Lafayette Mendel, Yale biochemist, and other scientists, Doctor Sherman made this significant statement:

"That the benefits to the human body from a high concentration of certain vitamins are different in kind from concentration of other food factors."

That is, surplus eating of these vitamins, over and above the strict body requirements to prevent deficiency diseases, is more than an insurance against deficiency level.

Vitamins in higher concentration actually act like new and more potently beneficial substances than the same vitamins in more moderate amounts.

Aid to Body.

Such is not the case with other food elements, like calories producing foods, proteins or mineral salts. Calory foods should be eaten just as much as the body actually needs for calories production. For proteins a surplus of 50 per cent in the body serves as insurance for emergency needs.

But the wonderful benefits ensuing from higher amounts of certain vitamins are of a positively new, constructive kind for the body.

Doctor Mendel said that Doctor Sherman's work has disposed of the widespread impression that longevity in man depends almost entirely upon inheritance. That is, scientific dietary prolongs human life, despite hereditary limitations.

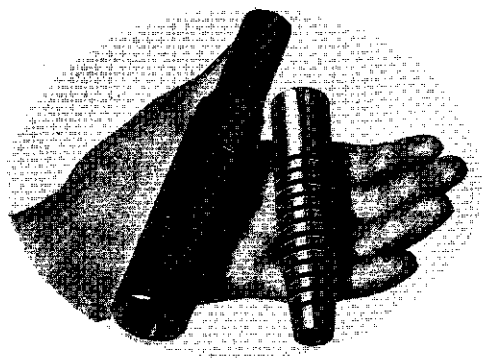
Out of the Dark

Freddie Miller

Science played a 1,000-to-1 gamble with the life of three-year-old Freddie Miller, son of Mr. and Mrs. Frederick Miller, of Columbia, S. C., and now the youngster is on his way home from Baltimore, Md., his sight restored. He submitted to seven operations, after he had run a paring knife into his left eye.

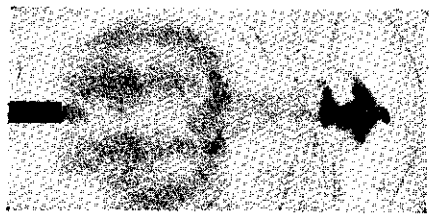
Takes the "Kick" Out of Rifle or Shotgun

A NOVEL "compensator" for the reduction of recoil peculiar to high powered rifles and shotguns has been introduced to sportsmen by a Connecticut manufacturer. It is claimed that it will reduce recoil fifty percent. Fitting on the front of the gun muzzle, it seems to get around the established physical law that action and reaction are equal, at least so far as the effect on the gunner's shoulder is concerned. All that the latter should feel is a mild, gradual push—instead of a vigorous "kick."

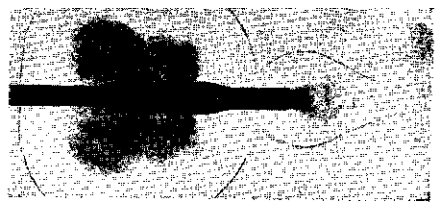


Two of the new recoil suppressors, the large one at the left for shotguns and the smaller one for rifles.

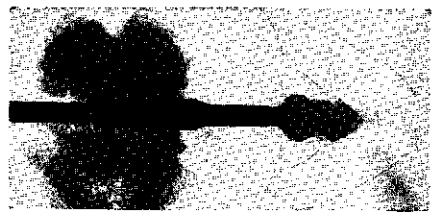
The secret of the shock absorption lies in what happens to the gases at the muzzle with the compensator attached. Gases issue from the muzzle of a military rifle at a pressure of about 5,000 pounds per square inch; from a shotgun at about three fourths of a ton to one ton per square inch. Within the body of the compensator the gases expand, the bore of the compensator being larger than that of the arm, and the expansion reduces the pressure. The remarkable high speed photos shown here illustrate how the gases escape sidewise through side cuts or ports of the compensator, instead of following in the direction of the bullet or shot charge. The velocity of the gas is such that probably one half of it is carried forward and compressed by the slope of the forward end of the torpedo-shaped compensator. The resulting compression is accompanied by a forward reaction of the compensator body. This forward motion, or pull, tugging against the urge of the gun to kick the man's shoulder, reduces the recoil.



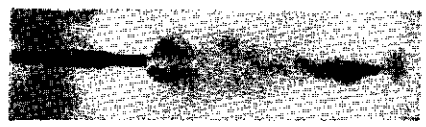
A shot charge, leaving the barrel of a shotgun without compensator, is pancaked by pressure.



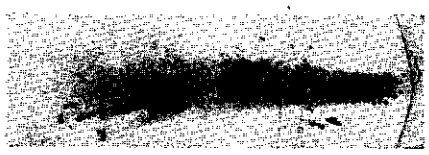
A shot charge passing through the compensator tube. Notice the gases escaping through ports.



Here the charge is leaving the tube, and gas escape is at maximum, counteracting the recoil.



Clear of the muzzle. The shots in the charge are perfectly bunched, without signs of scattering.



The shot charge in flight forms a uniform, compact pattern. The powder wads are left behind.

Household Ice Boxes May Go "Dry," Too

THE family ice man, vanishing before the spread of mechanical refrigeration, may come back—with a load of "dry ice" on his shoulder.

But his calls will be less frequent, according to Walter S. Johnson, one of the pioneers in developing the new refrigerant, who made the prophecy before the American Society of Refrigerating Engineers recently. A sixty-pound cake of the new substance, costing about seventy-five cents, will keep a household ice box at thirty to forty degrees Fahrenheit for a week, he declared.

This product, snowlike in appearance, is much colder than ice—about a hundred degrees below zero. Recently it has been used extensively for shipping ice cream and frozen fish and meat products, and, because of its compactness, it is preferred for the ice boxes of passenger airplanes that serve meals in the air.

Burnt Toast Packed with Invisible Diamonds?

THE possibility of making diamonds from burnt toast is suggested by Dr. S. Paramasivan, a brilliant physicist of Calcutta, India. Diamonds are carbon atoms packed extremely tight. The only difference between diamond carbon and lead pencil carbon is that the atoms in the latter are packed very loosely, like the crumbs of a sponge cake. Various kinds of carbon have different magnetic properties. Dr. Paramasivan is an expert on these properties. To his surprise he finds that many kinds of carbon, such as that of burnt sugar or a smoky flame, act magnetically like that of diamond carbon instead of like that of the graphite carbon of lead pencils.

Apparently the carbon of burnt toast is made up of myriad tiny diamonds too small to be seen by a microscope, and might be turned into gems if someone were clever enough to put them together in the right way. But try and do it!

Automatic Device Records Rhythm of Heart

THE hack work of laboratory workers in biology and physiology may be considerably lightened by the use of a time-saving invention recently perfected by a banker-scientist of Tuxedo Park, N. Y., A. L. Loomis, and described at a meeting of the National Academy of Sciences. It is a mechanism to record automatically natural rhythms of any kind, such as the heartbeat, the nerve impulse, or the flashing of a lamp.

The living body is a network of such rhythms. Prof. E. N. Harvey, of Princeton University, made extensive studies of these rhythms with the aid of the new device by isolating a turtle's heart in a special liquid medium and recording the variations in its beat over a period of many hours. (A turtle's heart will beat indefinitely after removal from the body, sometimes as long as thirty-six hours.)

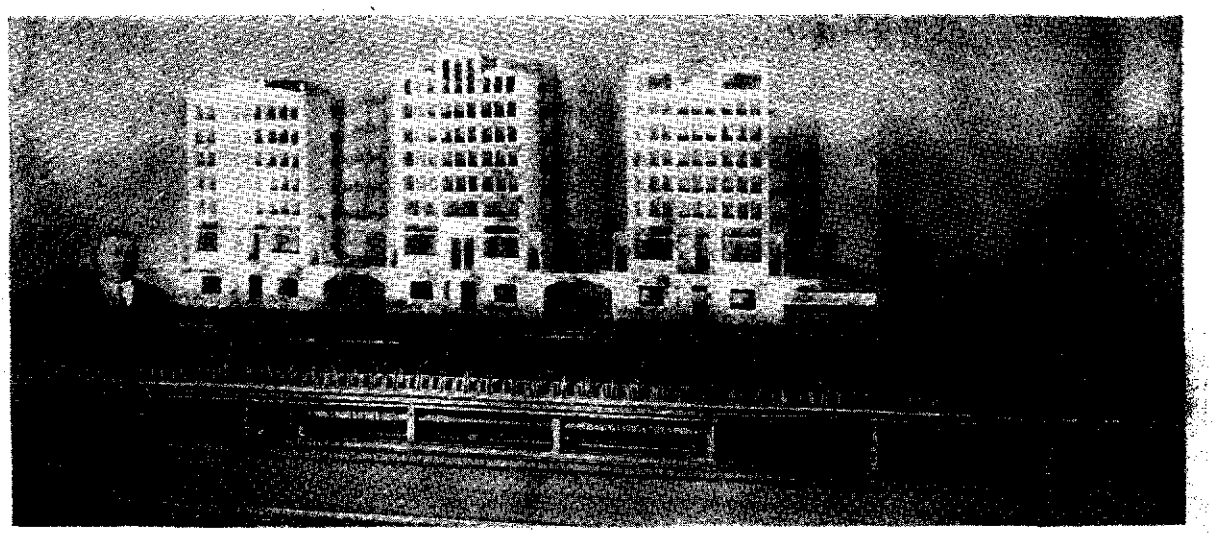
But here is the point of the invention. Formerly, if Professor Harvey had wished to make observations on the heart action he would have had to stay in the laboratory and take all the notes himself. Now the Loomis apparatus can take all the notes for him. It is geared in such a way that ten successive beats are recorded by a pen-drawn line indicating the time of the action. At the finish of ten beats the pen goes back to the zero line and starts recording again. The instrument can prolong this process for any length of time, while the laboratory worker may adjourn to lunch, a game of tennis, or anything else that pleases him.

Studying the fluctuations of bodily rhythms gives valuable data to physiologists. The effects of drugs on the heart action is an instance of the problems that may yield their answers by such methods as Loomis' mechanism makes possible.

Alcohol from Watermelons

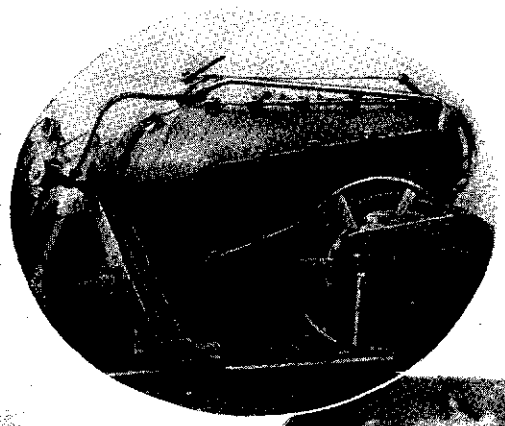
ON THE banks of the Volga River by the town of Stalingrad, Russia, a new factory has been established for the manufacture of syrup from the pink pulp of watermelons. This new product, known as "Nardek," will have its uses split in half; the better grades of the syrup will be used in cooking or confectionery, and the poorer grades utilized in the manufacture of alcohol.

Looks as though "vodka," the Russian whisky, would be made from watermelons instead of from corn after this.



Subway Moving Sidewalk

Above is a working model of a new nonstop moving sidewalk system demonstrated by its inventor, Herman E. Taylor, traffic supervisor of Detroit street railways. It comprises two worm-driven belt conveyors, one carrying seats and moving at a constant speed of 20 to 25 miles an hour, the other starting at ¾ mile an hour and accelerating to speed of the other in 9 seconds. Passengers would step from one to the other. The system would be underground.



Fighting Fires with Streams of Powder

Instead of water or liquid chemicals, Germany's newest type of fire engine pumps through the hose lines a harmless carbonic acid powder which is said to smother flames without damage to fixtures and goods. The powder pumping machine is pictured in the oval above. At the right firemen are seen "powdering" a blaze in an outdoor demonstration of the method.

Fuel Oil Carburetor

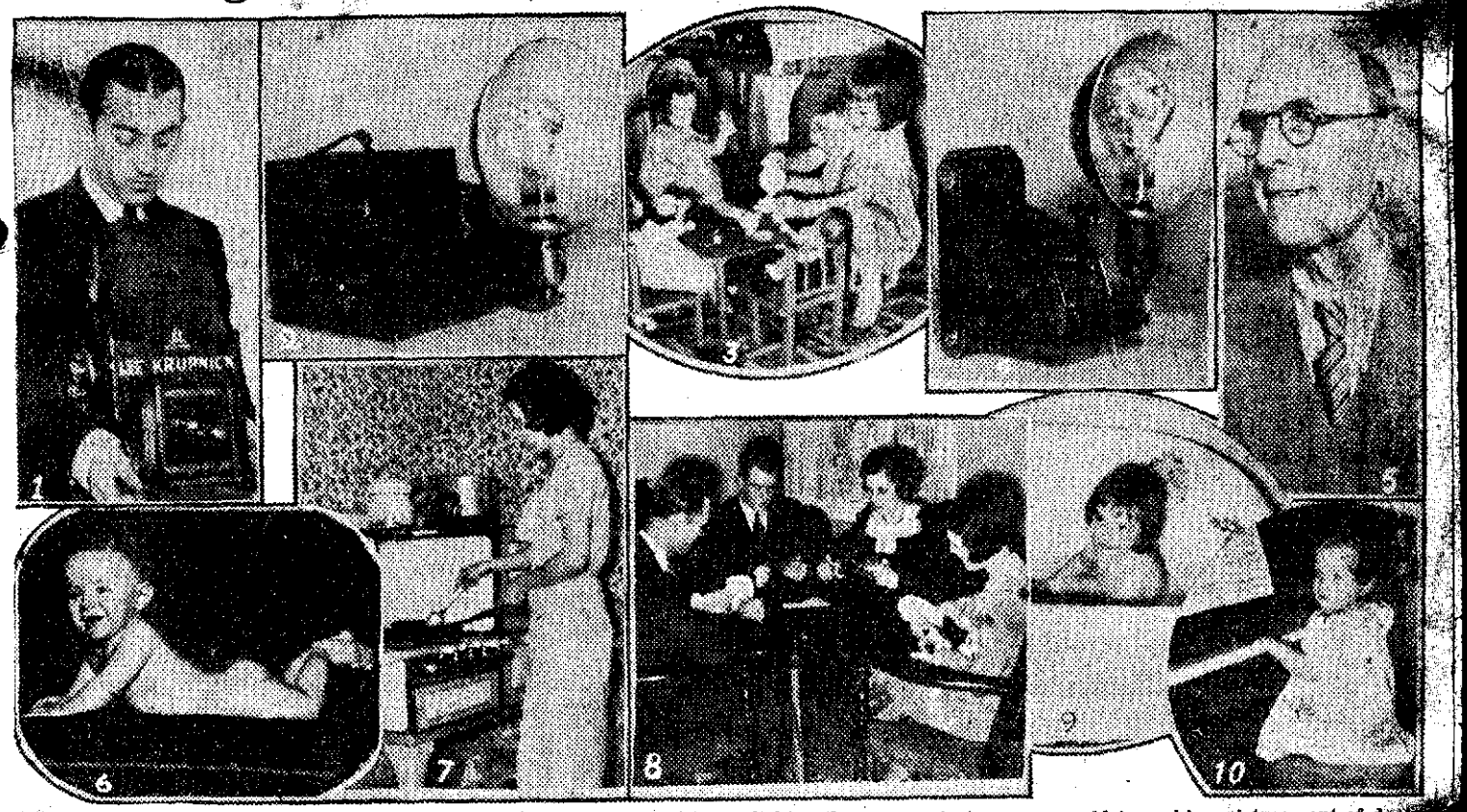
Joseph Graziano, New York shoemaker, has devised a carburetor which, he claims, permits use of fuel oil instead of gasoline in motor cars. It includes special spraying and heating chambers for vaporizing the heavy oil. Photograph shows the inventor and his son installing the device.

An Eight-Ton Armful This motorized "lumber buggy" supersedes the horse-drawn two-wheel cart in Pacific Coast mills to speed the transportation of lumber about the mill yards or to shipping docks. Straddling a pile of lumber, it lifts it bodily at the touch of a lever and carries it away at a speed of 15 miles an hour. The load pictured above contains 5,600 feet of lumber.

Featherweight Office Furniture

Aluminum is the latest material used for desks, chairs, and other office equipment. This chair, weighing only six pounds, can be lifted with one finger. The new furniture is fireproof, in addition.

'Sunlight' Made Possible With Any Kind of Camera



Illustrating the possibilities of the new invention of Lee Krupnick (1) and E. F. McBroom (5) the above pictures show scenes taken in the home with the clarity and ease of a camera taking pictures in the brightest sunlight. Picture No. 2 is the lighting device placed on an ordinary $1 box camera while illustration No. 4 shows the attachment on a folding camera.

With the new invention pictures are made in the home by merely clicking the camera just as you would in making pictures out of doo

The illustration (3) shows a child in her happiest moments play "house;" No. 6 is the picture the mother always wants first when a v visitor comes into the house; a kitchen scene has been easily pho graphed in No. 7; a memento of an enjoyable party is easily made as No. 8; every mother wants "baby in the bathtub" as is shown in No and No. 10 is another of the "brightest baby in the world" at the piano

Photography Made Simple By Invention of Tulsans

TWO TULSANS, lacking the power that was Joshua's when he commanded the sun to stand still, and yet finding it necessary that light be commanded, combined their mental powers. After two years of hard work and disappointment they learned they could not command the sun, but that they could have light and the right kind of light when they needed it.

As a result of their success with a cheap box camera, a bit of wire and piece of steel, they have brought within the reach of every man, woman and child the photographic ability of a professional and his expensive equipment, by the mere click of a shutter.

For a few cents, a dollar camera and the use of this invention, upon which applications for patents have been allowed by the United States patent office, the darkest corners of homes become as light as day for that instant light is needed to insure a perfect photograph.

LEE KRUPNICK, for many years photographer for The Tulsa Daily World, and E. F. McBroom, World building superintendent, for the past two years have worked on an idea which came to Krupnick about 10 years ago. The old style of flash light photograph, with its glare and resultant startled expressions on those photographed started Krupnick on a search for something that would eliminate all of that.

His purpose was twofold. He thought that it should be possible for any person, who could operate a camera, to take pictures on dark days and in dark places without spending a small fortune on equipment and long hours of study on the principles of photography.

As a professional photographer he had been called dozens of times by parents who wished to record on paper the expression of a child, or to preserve in a photograph some baby trick, or pose. But he found, as often as he was called, that the child was frightened out of that unusual expression by the presence of a stranger or the array of equipment the photographer carried.

KRUPNICK explained his idea to McBroom, who has a mechanical bent. The two experimented. They worked. They destroyed cameras and spoiled film by the hundreds of yards. They became, in turn, disgusted and jubilant and disgusted, until they finally were convinced that they had met with success.

Drawings of their device were sent to the patent office, and officials there, agreed with the inventors that they had something different and all of their claims were allowed.

A box camera, an inexpensive flashlamp holder and battery and a small piece of steel are the needed materials, but there is a way to connect them, and that is what Krupnick and McBroom have patents pending on.

At the present time thousands of dollars are being spent daily by camera companies to advertise special and costly lamps that give, in sufficient numbers, light by which inside photoigraphs may be taken. There are special types of film, slightly more expensive than the ordinary film, which are best suited for this type of photography.

BUT the simple little attachment invented by Krupnick and McBroom make [illegible] sary. The cheapest of cameras, Krupnick's simple attachment, and no skill at all will take any picture in the home.

Mothers, finding baby seriously at some childish make believe, with an unusual expression on his face, may in a second grab the family camera, and, in less than a second, obtain a permanent record of some outstanding incident of fleeting childhood. Failure is impossible.

"Revolutionary" is the one-word descriptive phrase that best compares the Krupnick-McBroom invention with the present method of taking pictures, and revolutionary it is.

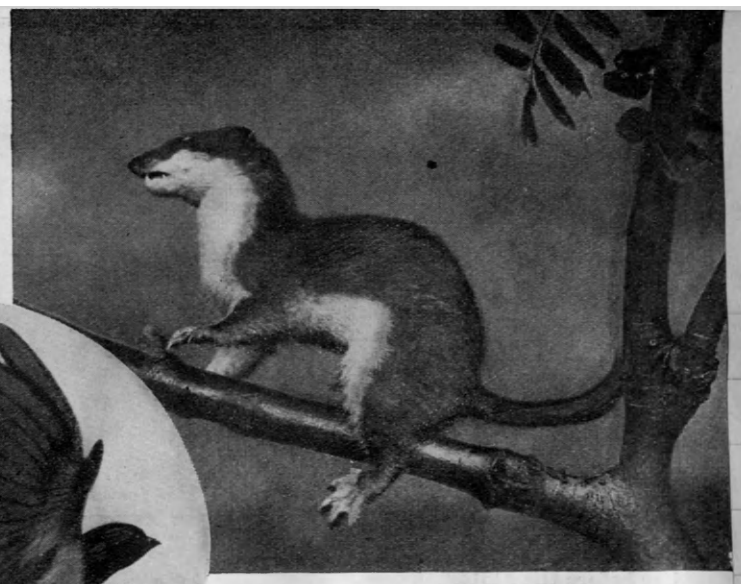
Although no steps have been taken to market the device, it is believed that negotiations soon will be under way to dispose of an interest in the gadget to one of the largest electrical houses in the world.

High-Speed Photographs Make Whirring Wings Stand Still

"ARRESTED motion" photographs at extremely high speeds may open a new world for nature study in the future. A bee's wings, it has been computed, beat at a rate between 2,000 and 3,000 times a second. But Joseph A. Speed, A.R.P.S., of London, has caught a bee in motion with a shutter so quick that not only were the wings shown stationary in the resulting photo, but even minute details and markings of the wings were revealed.

Other achievements of his new flashlight camera include catching a swallow in flight and snapping a stoat or ermine on its leap to a limb, the photo showing the animal's feet entirely free of any part of the limb. In order to get these pictures the shutter of the camera clicked within one five-thousandth of a second. The marvel of the camera mechanism lies in its ability to time the flash exactly with the shutter.

The photos were first publicly shown at the recent seventy-fourth annual International Exhibition of the Royal Photographic Society in London.



This rapid motion photo caught an ermine in the act of leaping to a limb. Notice that not one of the animal's feet is touching the tree branch.

A remarkable flashlight photograph of a swallow in flight, made possible by the fast camera shutter. The wings appear stationary.

Welded Steel Floors for Higher Skyscrapers

IN THEIR efforts to design higher skyscrapers architects are limited by an enormous dead load of flooring. To lessen this unnecessary burden on the building's supporting structure, a new type of floor panel construction has been invented by steel engineers. This revolutionary flooring, demonstrated recently before the American Institute of Steel Construction, is designed to act as a solid steel girder embracing the whole girth of a building, preventing tortional quirks and reducing the danger of high wind or earthquake action. So much lighter is the new flooring than the old, that for a seventy-five-story building it is calculated to save 2,000,000 pounds of dead load on the foundations for each column. This, it is said, would permit an increase of twenty-five percent in the height of the building. Thus may the dreams of 100-story buildings become a reality.

The new so-called "battledeck" flooring consists of plates "stitched" by a new automatic arc welding machine comprising a self-propelled vehicle carrying a wire feeding device, a reel of welding wire, and arc welding apparatus.

Dustless Garage Cleaning

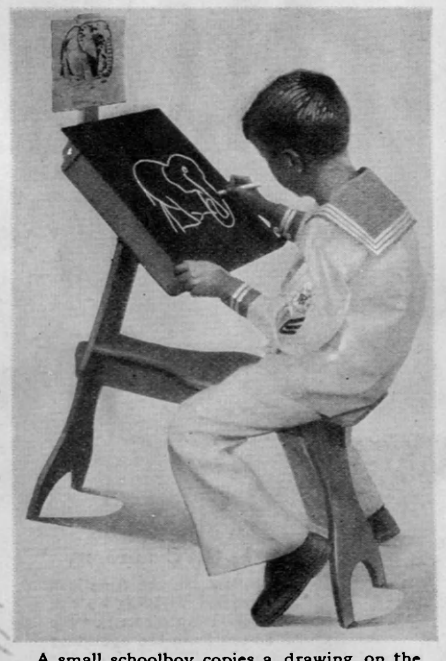
WHEN garage floors become covered with dust and spotted with oil, a sprinkling of sawdust or sand saturated with kerosene assists in the cleaning. It prevents clouds of dust from rising during the sweeping and the kerosene removes most of the small oil spots.

Knockdown Desk and Seat for the Schoolroom

A LIGHT combination desk and seat, which can be adjusted to suit any child from four to ten years of age, has been devised by a California inventor, who claims that the equipment weighs at least ten pounds less than the present standard school desk, is just as serviceable, and costs half as much.

The top of the desk consists of a shallow box of thin wood, made with a blackboard on the outside of the lid for small children and with plain top for larger pupils. At the upper end of this lid rises a holder for drawings or other material the child may have to copy. Inside the box are spaces for paper and writing utensils. The box itself may be closed with a catch and carried as a school box, to and from home, if desired.

Seat, legs, and standard which hold the desk consist of five flat pieces. Mortises and tenons bind the whole together solidly so that it may be moved as easily as a standard desk.



A small schoolboy copies a drawing on the blackboard lid of the new knockdown desk.

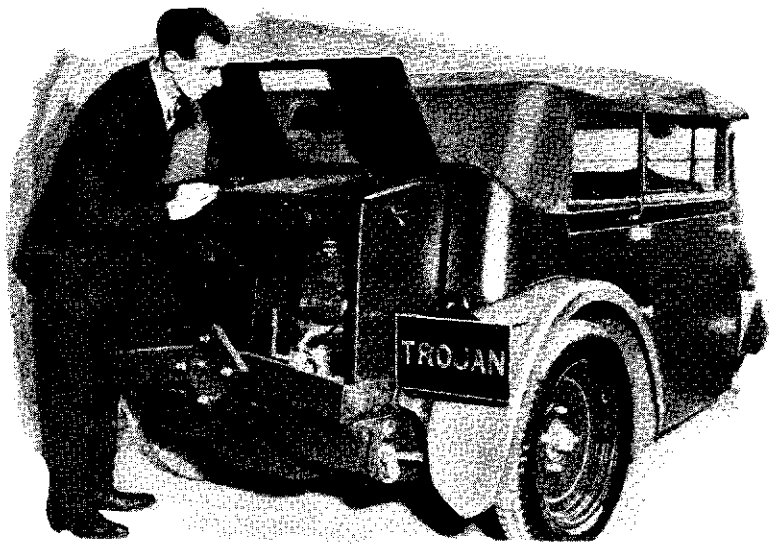
Tunnel Lined with Wood

YELLOW pine lumber has entered the field of tunnel engineering with the building of the new water conduit from the River Rouge to the Ford Motor Company Plant in Detroit, Mich. From the bottom of a seventy-foot shaft twenty hydraulic jacks are driving an enormous steel shield horizontally through the earth to make a circular tunnel nineteen feet in diameter. As the tunnel grows behind the path of the advancing shield, it is lined with long yellow pine boards, held in position by the pressure of the earth. Eighty thousand feet of board are so installed daily.

Heretofore the material ordinarily used for such tunnel lining has been cast iron. The chief advantage of the new tunnel material is its economy.

Chemicals to Remove Snow

THE problem of snow removal in large cities may be solved by chemistry after this year. Chemical methods of breaking up snow and ice along the gutters have been tried out this winter, particularly in the Boroughs of Manhattan and Brooklyn in New York City. In the latter borough, following a recent storm, four ice-caked streets were sprinkled with pellets of calcium chloride, the melting effect of which was said to be noticeable within a few hours. The manufacturers of the chemical claim that the pellets will drain snowdrifts down the sewers.

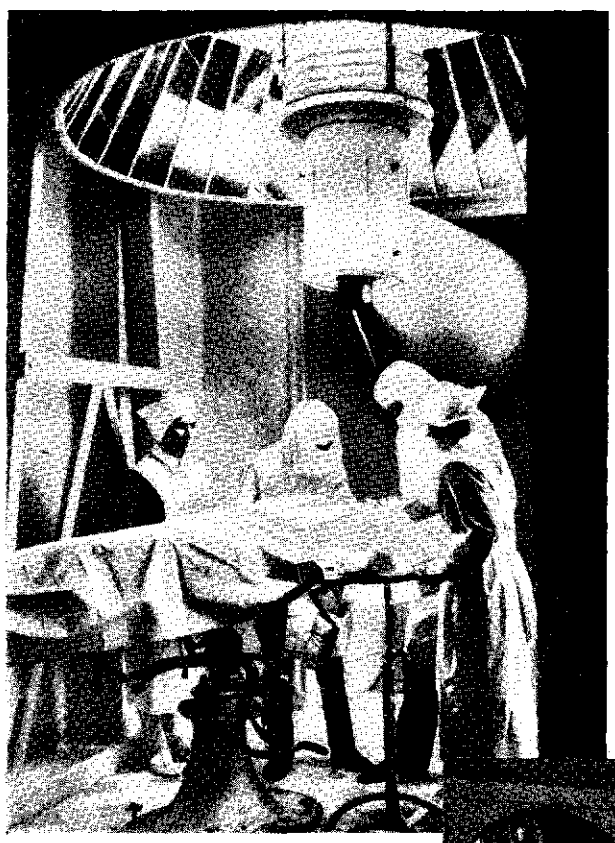


Car before the Motor

While the new front-wheel-drive car is being introduced in America, a British manufacturer has gone to the opposite extreme in the unusual model pictured above. Retaining the rear drive, its engine and radiator are placed in a trunklike compartment back of the chassis, between the rear wheels. Economy in power transmission and lessening unsprung weight are said to result.

Surgery in the Movies—

The motion picture camera and screen are playing an increasingly important part in the training of medical students. In the clinic of the University of Berlin, Germany, has been installed the special movie camera pictured above. Focused on the operating table, it makes a film record of every step in the surgeon's work. Later the film is thrown on a screen in a classroom, so that students may study the technique of the operation and make notes. Another method to the same purpose is described below.

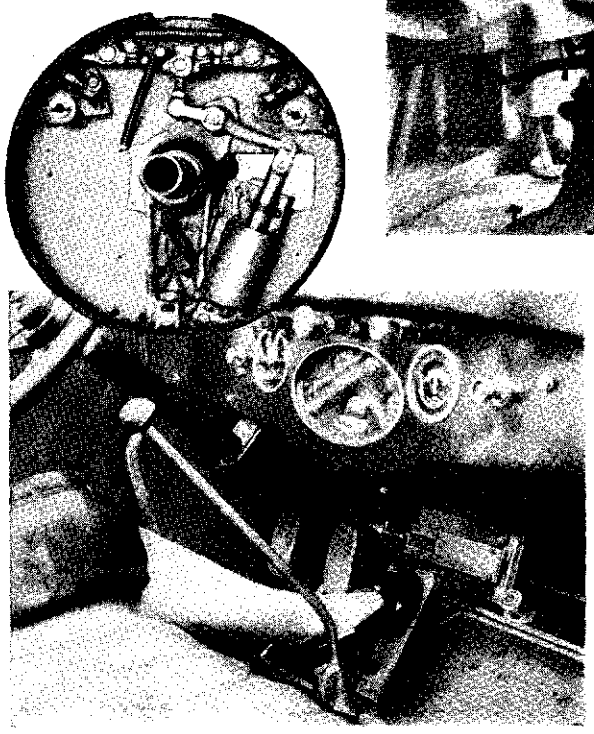


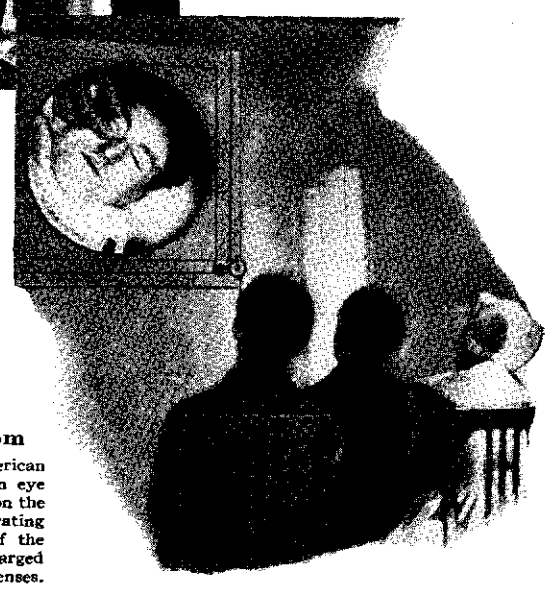
New Electric Auto Brake

Accelerator and foot brake are combined in one pedal in the new electric brake control shown below. Toe pressure on the pedal works the accelerator; heel pressure works the brake. The latter closes a circuit and actuates an electromagnetically driven solenoid (in the circle) which, in turn, moves the cams that apply the brake. The device operates on the usual six-volt car battery.

—and by Magic Lantern

Instead of the movies, the elaborate apparatus shown at the left is used in the American Hospital in Paris, France, to reproduce scenes of an operation for students. Suspended above the operating table, it works on much the same principle as the familiar magic lantern which projects photographs or post cards on the screen. By a system of mirrors and lenses, it transfers the scene instantaneously to a screen in an adjoining room, where the students are assembled. They also hear the voice of the surgeon describing the operation.





In the Classroom

Students in the American Hospital studying an eye operation projected on the screen from the operating room. The view of the patient is greatly enlarged by the means of lenses.

PLASTIC SURGERY WAS ANCIENT ART

But Facial Reformation Has Made Progress, Asserts Specialist

SPOKANE, Wash., March 8 (AP)—The art of rebuilding faces and patching up torn ears and noses was practiced when the Pharaohs ruled Egypt and the pyramids were only engineers' dreams, Dr. Gordon B. New, specialist of the Mayo foundation, told the regional meeting of the American College of Surgeons.

Since ancient times, however, facial surgery has made remarkable advances, said the Rochester, Minn., specialist.

The ancient Egyptian surgeon was aware of the possibilities of facial reconstruction and found patients among the warriors disfigured by enemy spears and youths badly handled in sports of the day, Doctor New said, but only in recent years has this type of surgery reached the point where almost any disfigurement can be obliterated.

"It is possible, for instance," Doctor New declared, "to build up an entire nose, using tissues of the forehead; an entire ear, either the upper or lower lip, the cheeks or parts of the eyelids."

The surgeon emphasized the first objective of the facial surgeon is not to enhance the beauty of the patient.

He described operations where entire noses, destroyed by disease, have been replaced with the result that faces formerly repulsive were made normal.

The World war gave impetus to this type of surgery, he explained. Thousands of soldiers disfigured by shrapnel have been given "good as new" faces through the grafting of skin, cartilage and flesh from other parts of the body.

U.S. Hunts Mystery Tree, Immune to Dutch Blight,

By HOWARD W. BLAKESLEE
Associated Press Science Writer.

ITHACA, N. Y., March 28 (AP)—Somewhere in the world there's an elm tree which scientists would like to find—in fact, must find, if the United States is to have any elm trees a few years hence.

This elm will be the now unknown species which can resist the Dutch elm disease. Extensive tests here indicate that there may be no such tree now in America. They show also that every elm, possibly the most beloved of American trees, is in danger of a blight for which science knows not the slightest remedy.

The Dutch elm disease appeared in Holland in 1919. It causes leaves to wilt and turn yellow and branches to die. It can turn a beautiful elm into a specter in a few weeks. At the longest it kills in a year.

In 15 years this blight has overspread Europe. It is rapidly destroying the elms on that continent. Four years ago it appeared in Ohio. Alert scientists caught it there. The blighted trees were destroyed and apparently the outbreak was eradicated.

But beginning in 1933 it appeared in New York and New Jersey. To date its presence has been verified in more than 1,000 trees. Others are suspected and almost certainly have it. That is an outbreak probably too great for control.

The blight is spread by a black beetle. At present there is no feasible way of exterminating the beetle nor of curbing his spread of the Dutch elm disease from tree to tree in all directions. By the time the tree starts to die it is almost too late to do anything for other trees. For at its beginning the disease is difficult to recognize. It requires careful laboratory analysis, where the infection shows as a brown discoloration of the cut wood of twigs.

The infection travels through the sap wood. This accounts for the rapidity of its ravages. The department of plant pathology of Cornell university has the fungus, the beetles, the infected wood and all the scientific literature of Europe and America—everything known to date about this tree menace.

None of these studies even suggests a cure.

The fungus is believed to have come to the United States in elm logs imported for veneer. The origin of the fungus is unknown. It is not thought to have been spontaneous in Holland, because some Chinese varieties of elm are slightly resistant. This fact indicates that at some time the Chinese trees have been exposed to the blight. Trees, like men under such circumstances, develop resistance.

European experts say the American elm is one of the most susceptible of all species to the Dutch elm disease. So far the present the hopes for American elms are not bright. A disease-resistant species, if discovered soon, might begin to fill the vacant places by the time the present elms are at the worst crisis of the epidemic.

Mystery in New Blue Gem

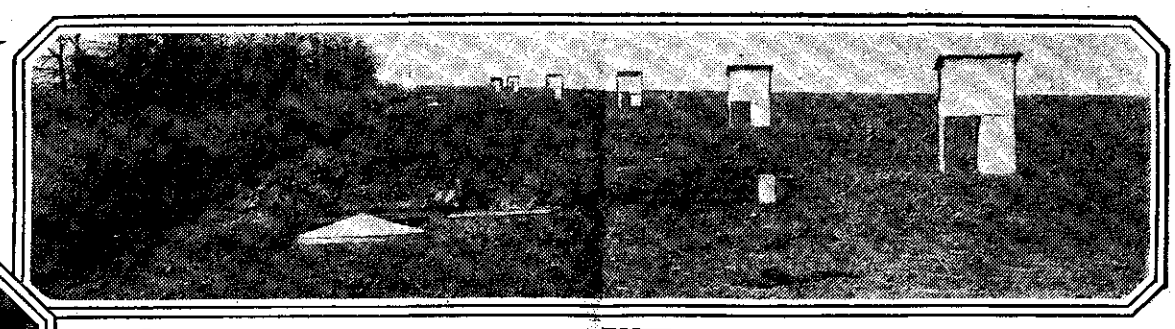
BEAUTIFUL deep-blue gems of zircon, hitherto known only in brown, greenish, or yellow colors, recently appeared in American markets and puzzled jewelers. Now the mystery may be explained with the observation of Dr. George F. Kunz, New York jewel expert, that they may owe their color to the little known and only lately-discovered element hafnium.

This expert, first to recognize the stone as a new variety of the semiprecious material zircon and to name it "starlite," first set about tracking its source. All samples turned out to originate from a single place, near Chantaboon, Siam. Brown zircon crystals, he found, were heated with cyanide of potassium, a poisonous compound, in a crucible for several hours. When they came out some of them were of the peculiar shade of blue. These were the heavier varieties of zircon.

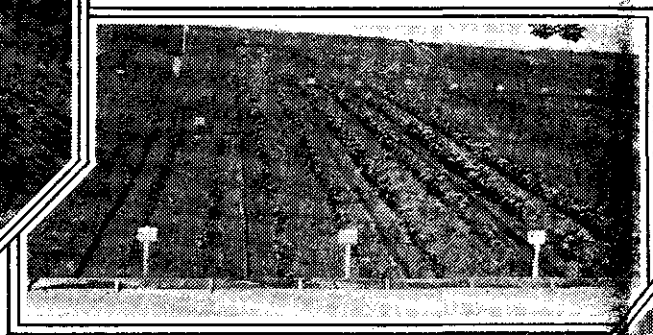
These very varieties, Dr. Kunz points out, are those that are known to contain the element hafnium in small quantities. He suspects therefore that the hafnium produces the color, which is brought out with the aid of the chemical treatment. Despite this handling, the gems are not considered artificial by jewelers; they are prized varieties of zircon. A five-carat stone of the new blue color, it is reported, sells for about $60.

The element hafnium, known only since 1923, was discovered by two Danish chemists and soon after was isolated in pure form from rare earths. Now it is known to be abundant enough to make up 1/200,000 part of the earth's crust, though commercial uses still await it.

EROSION



Increases EROSION



Extreme left—About one-third of the silt taken from the catch basins on a small one-fourth acre plot with rows running up and down hill following a single rain at the Red Plains Erosion Experiment farm, Guthrie, Okla. Above—All the run-off water and soil losses are caught and accurately measured in catch basins at the terrace outlets. Center—Erosion control plots where the effect of different soil treatments on run-off and soil losses are measured. Lower left—Silt caught in vegetation, at the lower side of a cultivated field, showing how a strip crop will check the soil losses.

EROSION increases erosion! Unless it is checked through crop rotation, contour farming, terracing, strip cropping and other known methods of control, erosion is like the stone that rolls down the mountain side gathering force and momentum as it goes. In the end there is the abandoned farm.

Erosion increases erosion. The work of the government erosion experiment farm in Logan county, Okla., near Guthrie, emphasizes this fact. Established in 1929, the work of the station is representative of the red Vernon soils of the southwest where the topography is rolling, where rains are frequently dashing and were erosion is great. Superintendent of the station is H. G. Lewis and the work is carried on by the United States department of agriculture in co-operation with the Oklahoma A. and M. college and the Guthrie chamber of commerce.

How Terraces Are Laid Out

When the station was established the farm selected was particularly adapted to the purpose. On the 160-acre tract was virgin land that had never been cultivated, timber land that had not been cleared, land that had never been farmed and other fields so badly eroded they could not be crossed with any type of farming equipment. A ridge almost cuts the main part of the farm in half. On the west slope of this ridge lies land, designated by the station as Field E, so badly cut up that part of it was no longer suited to agricultural use when the government took over the farm. On the east slope, Field C, is grass and timber land that was still in its natural condition.

In running terrace lines, two terraces were laid out around this ridge with outlets at each end, the dividing line for the terraces at the high point cutting them exactly in half with water flowing toward the outlets at each end. Slope and length and grade of one-half of each terrace are exactly the same as on the other half. The only difference is that on one side the land is badly eroded and on the other it is virgin.

Catch basins at the terrace outlets retain all soil washed down and measuring devices record exactly the run-off water. Soil losses as well as run-off water since the terraces were built have been twice as great in the catch basins on the eroded land as from the virgin land. Fertility of the eroded land is now washing away twice as rapidly as the fertility of the new land—erosion increases erosion.

Small erosion control plots have been set up to study effects of different treatments of the land on erosion. In this study one plot is 36.3 feet long and contains 1/200 acre. All the plots are exactly six feet wide. Catch basins measure run-off water and soil losses. Four years' results show that 14.98 percent of all the water falling on this plot has run off into the catch basin while the soil loss has averaged 22.65 tons per acre.

A companion plot in this length-of-slope study is 145.2 feet long and contains 1/50 acre. The slope is exactly the same as for the smaller plot and the two are side by side. The run-off from this longer plot has averaged 14.07 percent, slightly less than for the smaller plot, but the soil loss has averaged 39.62 tons per acre, indicating that the greater the length of slope, the greater the sweep of water and the more the soil loss.

The third plot in these erosion control experiments is a check plot of standard size, 72.6 feet long and containing 1/100 acre. Average run-off for four years has been 13.16 percent and the soil loss has averaged 14.18 tons per acre. All three plots are kept continuously in cotton.

The part that a good crop rotation plays in controlling erosion is well illustrated when the soil losses from the check plot, just given, are compared with soil losses and run-off from plots 4, 5 and 6 which are in a rotation of cotton, wheat and sweet clover. These are 1/100 acre plots. Run-off has been 11.72 percent for the four years, about 2 percent less than the check plot. The soil loss, however, has been only 6.30 tons per acre, less than one-fourth the loss of the check plot.

Grass Checks Soil Losses

Some lands now being cropped in Oklahoma and Texas should have been kept in grass. Some of our communities are finding this out and are getting these lands back into permanent pastures. The effect of grass in checking erosion is shown in another control plot where four years' results show a run-off of less than 2 percent of the moisture where the plot has been kept in bermuda sod and the soil loss has been practically negligible, being only .04 tons per acre.

Erosion increases erosion! Again in this control plot work this fact stands out like a sore thumb. All surface soil has been removed from one control plot to similate a badly eroded condition. This plot has been planted to cotton. Run-off water has averaged 28.28 percent of the total that has fallen on the plot in the four years and the soil loss has averaged 32.30 tons per acre. These results check closely with those from a larger field test showing the run-off and soil losses from terraced lands, badly eroded and virgin lands.

Burning over timbered land is also indicated by the station's results to increase and hasten erosion.

Contoured Rows Are a Help

The part that contour farming plays in checking erosion is illustrated in another test. One plot of one-fourth acre is planted to cotton each year with rows running up and down the slope. A similar plot is planted with rows running on the contour. Yields have been lower, run-off greater and soil losses about 3½ times greater on the up-and-down rows than on the plot with contoured rows.

Farmers within driving distance of the Guthrie station will find it a source of valuable information on every phase of this great problem of soil erosion. Other tests under way include soil-renewal work in which the station is trying to rebuild badly-eroded soil through use of cover crops, crop rotations and commercial fertilizers; a comparison of different types, lengths and grades of terraces; the use of various kinds of soil-saving dams and baffles that can be built of materials available on almost any farm, and the use of trees, shrubs, grasses and various types of dams as a means of reclaiming badly gullied grass lands.—L. E. C.