Secretary of Agriculture

Wallace: WHERE SCIENCE HAS FAILED

SCIENTIFIC AMERICAN

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Giant Pandas from Western China (See page 281)

SCIENTIFIC AMERICAN

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NINETIETH YEAR • ORSON D. MUNN, Editor

CONTENTS · JUNE · 1934

Cover

THE photograph by R. T. Dooner, reproduced on our cover, shows a habitat group of a rare giant panda family which has just been unveiled in the Free Natural History Museum of the Academy of Natural Sciences, Philadelphia. The group includes a male, a female, and a young panda in surroundings reproduced from sketches and photographs made in Szechuan Province, Western China, by the Dolan-West China Expedition under the leadership of Brooke Dolan II. The background was painted by C. Clark Rosenkranz and the group was erected under the supervision of Harold T. Green.

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ACROSS THE EDITOR'S DESK

SOME astonishing results in telepathy have been attained in a series of experiments conducted by Dr. J. B. Rhine of Duke University. These experiments have been conducted over a period of approximately three years and results have been recorded in a precise and accurate manner. Throughout the entire series all disturbing factors were eliminated as far as possible, so that the results might not be vitiated by outside influence. Dr. Walter Franklin Prince, who was of great assistance to the other editors of this magazine in conducting their tests for telepathy, has prepared an article on the experiments at Duke University, in which he gives an excellent survey of the entire work. This article is scheduled for publication in our July issue.

●

EVERY once in a while the subject of rockets crops up in the daily press—rockets for interstellar flight; rockets for lunar exploration; rockets for sampling the upper air; rockets for intercontinental travel. This is at least evidence that some serious thought is being given to the subject of rocket propulsion in general and that a certain amount of experimental work is being conducted. In an article entitled, "What's in the Rocket?", G. Edward Pendray, President of the American Rocket Society, tells something of the work that is being done in various countries of the world, what may be expected of rockets constructed on various principles, and of rockets which are now being constructed for use in the near future. It may be surprising to most people to learn that rocket societies in various parts of the world have a total membership of between two and three thousand. Mr. Pendray's article will appear next month.

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AN intensely interesting and humanized story of one branch of research that is being conducted in an effort to combat the dread scourge of cancer is told in an article by T. Swann Harding scheduled for publication next month. Dr. Frederick S. Hammett, in a small and unimposing laboratory in Massachusetts, is performing and directing some of the most fundamental research on the cancer problem now being carried on in this country. Mr. Harding presents a masterly survey of the work which Dr. Hammett is doing and the things which he hopes to accomplish. The problem is difficult and its solution will be a long and tedious job. It is hoped, however, that research based upon principles established by countless experiments and observations will eventually lead to this solution and will free humanity from one of its most deadly enemies. So far the research has turned out according to expectation; only future findings can determine the exact value of the present work.

NEXT MONTH

¶ Dr. Walter Franklin Prince on a remarkable series of results obtained in telepathy tests.

¶ T. Swann Harding tells of an outstanding piece of research on cancer.

¶ G. Edward Pendray writes on the subject of rockets: What they have done and what may be expected of them.

COMING

¶ P. F. Valentine, of San Francisco State Teachers College: A philosophical article entitled "What is Personality?"

¶ George W. Kosmak, M.D., Editor, *American Journal of Obstetrics and Gynecology*, on "Why the High Mortality in Childbearing?"

¶ The viewpoint of the opponents of sterilization, written by a well-known Catholic, will be presented soon.

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DURING the past few months we have presented a series of articles detailing the methods used in laying out various types of sundials. In our next issue R. Newton Mayall and Margaret Walton Mayall, authors of the several articles on sundials already published, take up other phases of the subject. They discuss in detail various materials which may be used in the construction of dials, tell something of the inscriptions which are frequently used, and give a detailed discussion of the equation of time and its application to sundials. Those who have followed our articles on this subject so far will find the next one to be of outstanding interest.

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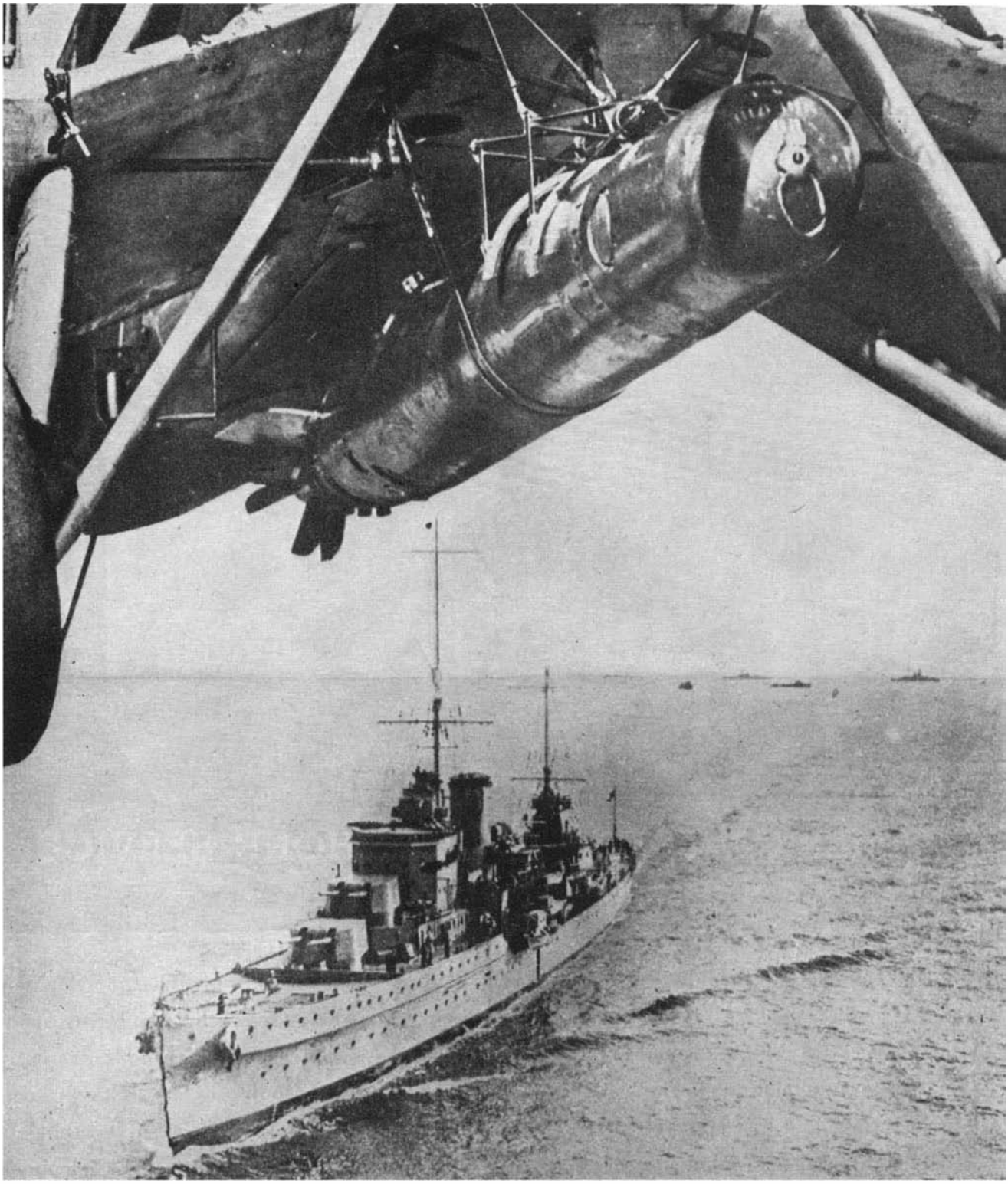
"I BELIEVE in sterilization of the unfit because it is the duty of medicine to prevent disease and this is one means of prevention, mental and otherwise. I believe it should apply to all mental cases, congenitals, drunkards, criminals, moral defectives. It is hoped that it will be successful in Germany, and most probably it will be successful. It eventually will come to all civilized countries as a means to get rid of the scum of humanity." Thus writes Dr. Adolph Lorenz, prominent Viennese surgeon, of a subject which is dealt with in an article starting on page 292 of this issue. A second article on the same subject, prepared by E. S. Gosney, President of the Human Betterment Foundation, will be published next month.

●

SPLITTING seconds with an unimposing crystal ring is one of the achievements of research in time keeping. All human activity and business are based upon time. Accuracy of time keeping is a vital factor in many industries and for these reasons any improvements which can be made in recording the positive time can immediately be put to practical use. The story of how crystals control time and of the important part which these crystals play in our daily lives is told in an article scheduled for publication in an early issue.

Editor and Publisher



MODERN WARSHIPS OF THE SEA AND AIR

A STRIKING view of a British bombing plane passing over the cruiser *Leander* during recent maneuvers of the British fleet in the North Sea. The huge aerial torpedo and its holding mechanism symbolize the potential destructive ability of modern airplanes capable of carrying heavy loads. The subject of such planes and their possibilities in offensive warfare against large cities is discussed by Professor Alexander Klemin in a note in the SCIENTIFIC AMERICAN Digest department of this issue.

IN the accompanying article Secretary Wallace states that the scientists have given the world vast new forces which sometimes help us but sometimes enslave us (as in war, or in machine exploitation), and that science, which has released these new forces, now owes it to the world to control them. Heretofore men of science have not done their research with any definite thought in mind concerning what others might later do with their discoveries. They work mainly from sheer scientific *curiosity*—it is fun to find out new facts about the universe.

It happens, however, that these same scientists (with certain regretted exceptions to whom the author alludes) are the world's little corps of very best minds—the exact thinkers—not over 100,000 strong all told. The greatest problem which humanity has to face at the present stage of its career—the raw half-digested stage of the young Age of Science—is the fact that most of the other 1,999,900,000 human beings are essentially unprepared to guide the powerful toy placed in their hands by the 100,000, as unprepared as a drunken man to guide a motor car. Yet do the scientists lead the world? No, it is the statesmen and politicians—representatives of the other 1,999,900,000.

Suppose, then, that a scientist were actually put in command, as the Secretary hints might be best. The first question we must ask is, would the 1,999,900,000 be wise enough to accept their own advantage, or would they slip back into the control of some inexact thinker better equipped with gift of gab to exploit the foibles of human nature? Could water be made to rise higher than its source? We wonder.

In any case, Secretary Wallace's discussion is provocative.

The SCIENTIST in an UNSCIENTIFIC SOCIETY

By HENRY A. WALLACE
Secretary of Agriculture

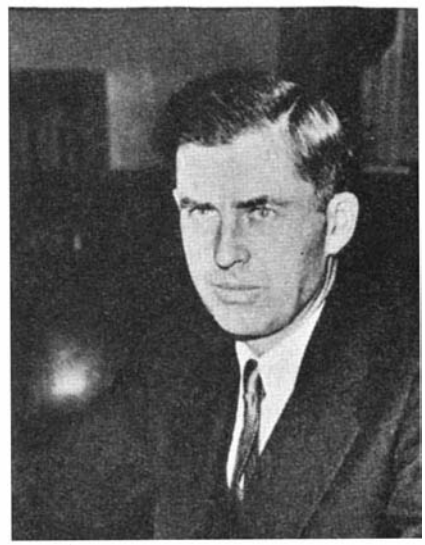
HAVING made possible material gains during this Century of Progress greater than in any other age, science ought now to be receiving the thanks and the homage of a grateful people. Instead, it is the object of indignant questions as to its value to society, and proposals for "holidays" on research are augmented by further proposals to turn the clock back to more hand labor, to fewer creature comforts, and to the presumably simpler life of our grandfathers.

To many scientists this state of affairs is very puzzling. Called out of their laboratories to contemplate the situation, they denounce these lay proposals as moonshine, as grotesque impediments to progress; and as they turn back to their researches they refer irritably to the ungratefulness and the stupidity of mankind. Which of course leaves the situation right where it was.

A more recent attitude, expressed in the attempt of distinguished scientists to prove that science really creates new jobs rather than more unemployment, or that it makes it possible for efficient farmers to make a profit with low prices, is not, I fear, a very effective answer to the present plight of the world. It is extremely difficult to argue five or ten million unemployed into jobs, or to ignore the fact that a million and a half farms have gone under forced sale since 1920. And of course it completely avoids the real issue; that is, whether science, having demonstrated its power to transform the world, ought not to have some responsibility, or at the very least some interest, in the social consequences of its handiwork.

I can understand the impulse which prompts scientists to defend science against the attacks of the uninformed: Science has achieved so many miracles for society, saved so many lives, made possible so extraordinary an advance in material living standards for so many millions of people, that it is disquieting to think that all the consequences of science can ever be other than good. Yet I don't see what basis we have for assuming that science can and does have only beneficial consequences. Is the product of man's curiosity inevitably good? Is there any reason for assuming that the end result of any enlargement of human knowledge must, perforce, be beneficial? It may be disturbing to realize it, but the truth seems to be that science proceeds without moral obligations; it is neither moral nor immoral, but in essence amoral.

BUT in the applications and consequences of science, there is quite another story. No amount of complacency with things as they are can conceal the fact that science has enormous social implications, that it is continually transforming man's environment, and that while most of the transformations seem all to the good, others are exceedingly painful if not downright tragic. In other words, science keeps on assiduously transforming the world, and trusts to luck that the transformations will be benign, beneficial to the majority.



Hon. Henry A. Wallace

The customary rejoinder at this point is that research would never get done if the scientist endeavored to foresee the social consequences of his research, and that—which is more to the point—no human mind ever could foresee the consequences. Could Faraday and Maxwell, it will be asked, have foreseen the social problems—and opportunities—involved in the development of electric power? Of course they could not. Nor could Watt have visualized the full results of his work, or Galileo of his, or Mendel of his.

A rejoinder of this sort really only demolishes a man of straw. No sane person would ask or expect a scientist to foresee what cannot be foreseen. Nor would any thinking person insist that scientific research be limited to projects

Typical of the machine's easy conquest of obstacles. In replacing manpower, have such applications of science fulfilled a mission for the good of all?

the results of which we may be sure, in advance, will be socially comfortable and convenient. Indeed, any proposal to limit research is hardly intelligent.

But that is not the point. What we are concerned about today is not scientific research, *per se*, but the practical applications and the consequences of that research. Society can believe in science with an unshakable faith, can insist upon more and more research in every field, but society must at the same time be exceedingly watchful of the consequences of the layman's application of science to the social organization. And yet it is precisely at that point —the point of contact between science and society—that the orthodox scientist either withdraws to his cloister, to mutter about the stupidity of mankind, or, if given to public utterance, to indulge all too frequently in amazingly unscientific statements of a variety habitually used by the very politicians he scorns. I question whether that kind of activity is either an adequate defence of science or a contribution to our sorely perplexed society.

HERE, for instance, is a factory hand shoved out onto the bread-line because labor-saving machinery has been installed in his factory. In good times it may be months before he can find another job; in bad times, years. Science perfected that labor-saving machinery. Despite the fact that science at the same time has created new jobs, stimulated new wants, the interval between his old job and a new one is all too often a tragic interval for that wage earner and his family. What do you suppose is the reaction of that individual to statements that science does not, in fact, take away jobs? Or to the recent statement of a distinguished scientist that the "benefits of scientific research flow to all classes of the population and even the least competent of the people find themselves a step further from the starvation line"?

I marvel at the complacency of remarks like that in times like these. Virtually all scientists, I am sure, want the benefits of scientific research to flow to all classes of the population; to many scientists reveling in the luxury of indulging their intellectual curiosity, the thought that science is benefitting all men, even the least competent, is a comforting and a Christian reflection.

But I should want to be sure it was true. It is hardly enough to wave away the charge of technological unemployment with a few casual statistics about the abolition of the carriage industry and the subsequent sensational growth of the automobile industry. Certainly any such statistics should be examined and presented more carefully, more scientifically, if you please, than is done in the usual after-dinner speech before a group of well-fed scientists and donors of funds for research. Perhaps it might be a good idea, in order to encourage scientific caution, to have a few of the technologically unemployed present at such occasions to engage in some mild heckling.

Those who are interested in examining this problem of technological unemployment, and of the social implications of science, might consult that very useful report prepared during the previous Administration, "Recent Social Trends." The authors of this could hardly be accused of unfriendliness to science, yet they declared that the majority of American workers are chronically threatened either with total loss of income through unemployment, or with unpredictable fluctuations in the buying power of their income due to changes in the price level. In the last 15 years there have been three huge changes in the price level, and four cycles of unemployment. Technological unemployment seems to increase with increase in invention, and seasonal unemployment is growing due to the increasing violence of style changes. Regional shifts in industry, though not increasing total unemployment, make for great local hardships. Finally, although the proportion of older people in the total population is steadily gaining, the older workers, even those over 40, are finding it harder to keep their jobs. It would be possible to point to parallel problems in agriculture.

All this, plainly enough, is not the fault of science; it is a product of the misuse by society of the instruments and forces science has given to the world. But in that misuse, in that exploitation, all of us have some responsibility, and it seems to me that the scientist, for reasons of self-interest if for no other, ought to have a peculiarly acute interest.

LET me reiterate that I am not for a moment denying the contributions of science to society, or even arguing that there has not resulted a genuine net gain. What I do believe, however, is that we have reached the time when these gains may be lost altogether, and future gains made extremely difficult, unless certain social attitudes and adaptations are perfected very rapidly. And in developing these attitudes, in helping society to make the necessary adaptations, it seems to me that men of science must play an important part. They may not be able to foresee the consequences and the social implications of their researches, particularly in the field of pure science, but should they not have some voice in the use society makes of their research? Instead of complacent after-dinner speeches in sweeping defense of science, I should like to find our more articulate scientists insisting that the benefactions of science be used only in ways that are plainly in the general welfare. It would be encouraging to find, among scientists everywhere, some evidence of honest indignation at the way the gifts of science have been turned against society and therefore against science itself.

The scientist-in-the-cloister will, I suppose denounce all suggestions of this kind as scientific heresy. Perhaps they are scientific heresy—but our problem remains. The scientist does, it is true, face a dilemma inherent in his specialization. He is much inclined to let the shoemaker stick to his last; let the chemist, that is, stick to chemistry, the engineer to engineering, the mathematician to mathematics, the economist to economics—and the politician, presumably, to politics. But if extreme specialization is to prevail, no one should be surprised at the widening gaps between the chemist, say, and the economist, or

between the engineer and the politician. Nor should anyone be amazed that the chemist knows only chemistry, and the politician only politics.

The dilemma growing out of specialization is serious enough, I grant, but the real problem is elsewhere. The real problem is that so many scientific men still seem to hold that there are beliefs —notably economic and political beliefs —which are subject to acceptance, but never to inquiry. I have heard some of them talk as if the gold standard were an Act of God. No wonder it has been said that *laissez-faire* economics is closer to medieval scholasticism than almost any other intellectual activity in the modern world.

I suppose our scientists and inventors today have enough new stuff within their grasp or just around the corner so that the world 30 years hence could easily have a total productive power twice that of today. It is almost equally possible that the total wealth-producing power of the world a generation hence will be less than it is today. The trouble, if it comes, will not be in the inability of scientists and technologists to understand and to exploit nature, but in the ability of man to understand man and to call out the best that is in him. In solving this limitation the scientists and engineers have all too often been a handicap rather than a help. They have turned loose upon the world new productive power without regard to the social implications. One hundred years ago the power looms of England destroyed the cottage weaving industry, and during the early years of that impact misery strode over the countryside of England in proportion as the *nouveaux riches* gained capital to exploit their gains over the entire world. That kind of thing has been done again and again, and we have called it progress because the power of man over nature was increasing and because in the long run the common man shared in this increase. What happened to the common man in the short run, of course, could be of no concern to a *laissez-faire* society.

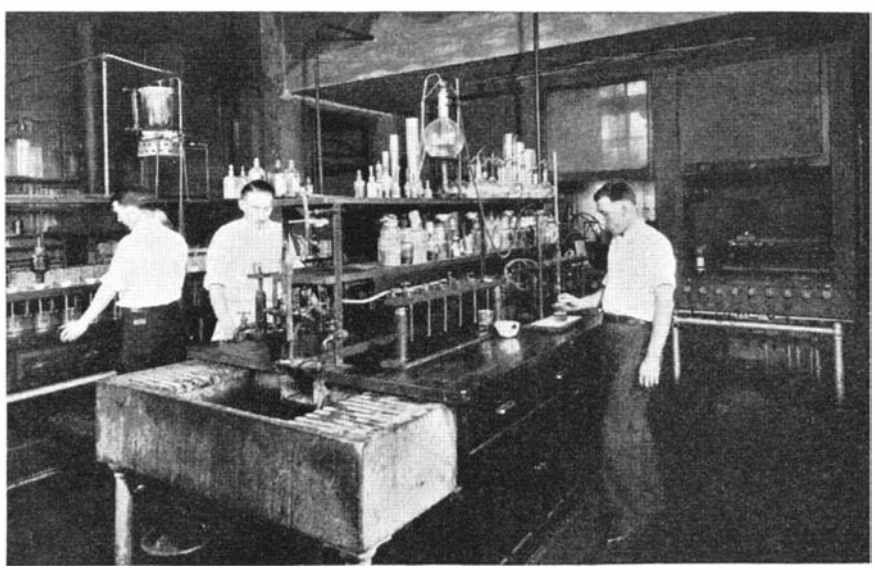
I WOULD like to suggest that the very training which made possible the enormous material expansion of the past century may to some extent have made impossible the building of a just social system for the prompter and more uniform distribution of the wealth produced by the system. Most of the scientists and engineers were trained in *laissez-faire*, classical economics, and in natural science based on the doctrine of the struggle for existence. They felt that competition was inherent in the very order of things, that "dog eat dog" was almost a divine command.

The power discovered by the scientists and inventors was applied in the United States by a race of men who had developed a concentrated individual willpower and an extraordinary thriftiness as a result of several generations of pioneer agricultural training and Protestant church-going. As a result, human power of high spiritual origin, but debased by the sophistication of the "devil take the hindmost" economics of the colleges, took command of the exploitation of the discoveries made by the scientists and inventors. The scientists and inventors have an intense kind of religion of their own—certain standards to which they like to be true—and as long as they could get enough money to pursue their researches, why should they care how someone else handled the social and economic power derived from these researches? Perhaps that is putting the matter unkindly, but other explanations that might be advanced are not much more flattering. Those who delved too deeply into social and economic problems got into trouble, and so many of the best scientists felt it was not good form to do things which to certain types of mentality seemed impractical and which might endanger science's financial support.

It is my observation that previous to 1933 more than three fourths of the engineers and scientists believed implicitly in the orthodox economic and social point of view. Even today I suspect that more than half of the engineers and scientists feel that the good old days will soon be back when a respectable engineer or scientist can be an orthodox stand-patter without having the slightest qualm of conscience. It is so nice to feel that there are great supermen from whom, directly and indirectly, we draw our own sustenance, who, sitting Jovelike above us lesser mortals, make possible the free functioning of the law of supply and demand in such a way that their profits enlarge at the same rate that our research expands. Like most of us, I rather like that kind of a world, because I grew up in it; in some ways, I wish we could get back to it. But both my mind and my instinct tell me that it is impossible for any length of time. Of course, if prosperity returns within the next year or two, it is possible for us to think that we are back in that old world again. But unless the people who make profits and direct capital allocation to different productive enterprises have seen a great light, or unless we move forward into certain highly centralized forms of industrial and governmental control, we shall sink back into our former trouble.

IT is difficult to see how the engineer and the scientist can much longer preserve a complete isolation from the economic and social world about them. A world motivated by economic individualism has repeatedly come to the edge of the abyss, and this last time possibly came within a hair's breadth of plunging over. Yet science, all this time, has been creating another world and another civilization that simply must be motivated by some conscious social purpose, if civilization is to endure. Science and engineering will destroy themselves and the civilization of which they are a part unless there is built up a consciousness which is as real and definite in meeting social problems as the engineer displays when he builds his bridge. The economist and the sociologist have not yet created this definite reality in their approach; can you who are trained in engineering and science help in giving this thought a definite body?

Secretary Wallace's challenge can not be ignored. We expect, therefore, to have comments on his article by a number of noted men. These comments will be published in coming issues.—The Editor.

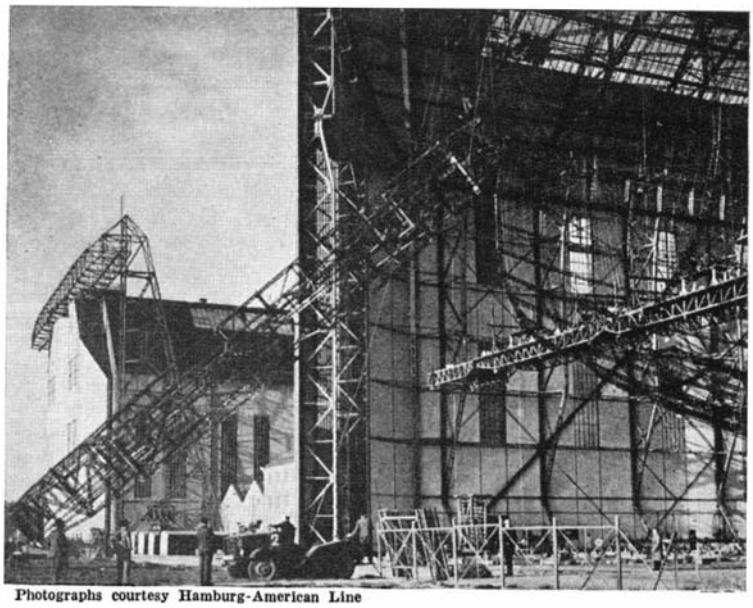


From laboratories such as this have come momentous discoveries that may or may not have disturbed our social equilibrium—according to one's viewpoint

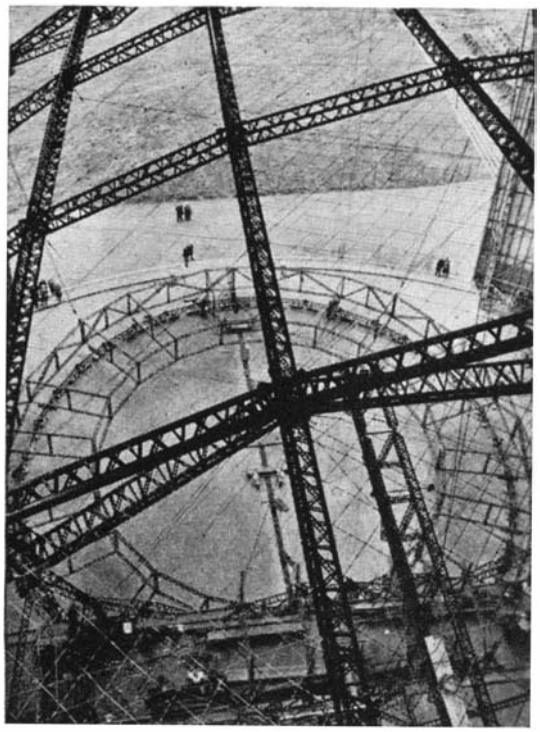
A Flying Hotel

Double the Size of the *Graf Zeppelin*, the *LZ 129* Will Provide Many Passenger Comforts

THE most ambitious aircraft yet designed for transatlantic service is rapidly nearing completion at the Zeppelin Works in Friedrichshafen, Germany. The *LZ 129*, big sister of the *Graf Zeppelin*, will have a volume of 7,070,000 cubic feet as compared with the *Graf Zeppelin's* 3,700,000. When completed next fall, the *LZ 129* will be 812.7 feet long, with a maximum diameter of 135.4 feet.

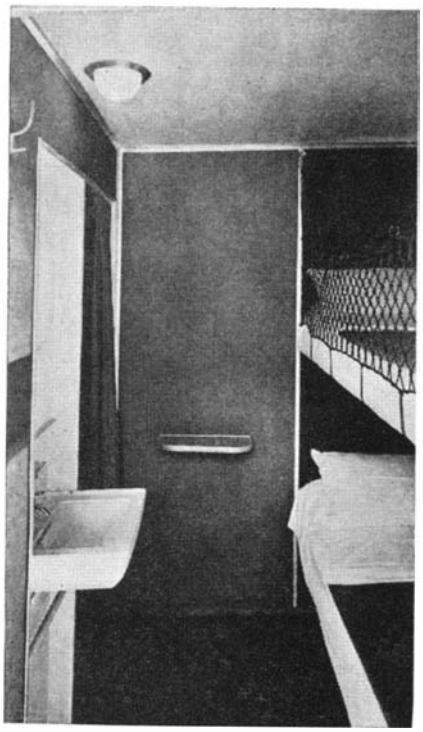


Photographs courtesy Hamburg-American Line



View from the unfinished skeleton of the *LZ 129*, showing one of the huge rings ready to be hoisted to its final position in the frame of the airship

***Left:* The ring starts up. A side view of the ring shown in photo above, partly clear of the ground**



One of the passenger cabins, with two beds and hot and cold water

The passenger accommodations, the crew's quarters, the pilot's "bridge," and the wireless room on the *LZ 129* will be within the hull. An electric lift will facilitate loading and unloading the cargo; huge wheels affixed to the pilot's gondola and the lower fin will aid in landing.

The passenger accommodations will be on two decks with a total floor space of 5380 square feet. The upper deck will contain a dining-room, social hall, writing- and reading-room, and 25 passenger cabins, each with two beds and running hot and cold water. The used water will not be discharged, but will be conducted to a special tank as ballast. On either side there will be a 45-foot promenade deck. On the lower, or B deck, are to be baths, officer's and crew's quarters, and a smoking room. The *LZ 129* will be the first German airship on which smoking will be permissable. This has been made possible by the introduction as a lifting agent of helium gas, hitherto confined to United States airships.

After the frame work has been finished, the "suit" of the *LZ 129* will be tailored. The "pants" already have been completed, using a total of 35,000 square yards of cotton-linen material.

THE important choice of motors has been delayed to give the constructors an opportunity to await tests of the latest Diesel types. The *LZ 129* will be the first airship equipped for crude-oil locomotion.

The *LZ 129* will be able to travel 8000 miles without refueling, and will maintain a cruising speed of 80 miles per hour. She will accommodate 50 passengers and 10 tons of payload in addition to its crew of 35. The airship, if placed in the North Atlantic service, should be able to make the crossing in 40 to 42 hours eastbound and in 60 to 65 hours westbound.

The commission for designing the interior decorations of the new German airliner has been given to Professor Fritz August Breuhaus, of Berlin, who conceived the beautiful room decorations for the liner *Bremen*.—*By Wolfgang Lambrecht.*

OUR POINT OF VIEW

Cosmic Snoopers

WHAT is it that keeps a scientist at work? He has little or no hope of sharing the financial rewards he knows that others may reap from his discoveries. Commonly his devotion is believed to be the result of some kind of scorn for money. Few scientists, however, scorn money. Most of them would like to possess it, but they seldom have a chance even to consider the matter. The average scientist can find as many uses for money as the next man can. He, too, enjoys creature comforts, a widespread belief to the contrary notwithstanding.

Less commonly one hears that the mainspring which activates the scientist in his arduous research is his desire to benefit the human race. Sometimes this is true, and as an incidental it is probably always true, but it is not his main motive—not the one which holds him to his experiments.

What does hold the true man of science to his laboratory table is a much simpler thing: curiosity, pure curiosity. He wants to know "what it is all about." A woodchuck is curious to see what sort of erect-walking creature it was that chased him into his hole, and soon puts his nose out again, to look. Mrs. Jones is curious to know what is in that odd-shaped package which Mrs. Smith next door is bringing home, and puts her nose somewhere else to find out. The scientist is curious to know what is within the atom and beyond the galaxies and sticks his nose into all sorts of places in order if possible to learn more facts—not necessarily because he wants to use them but because he wants to know them.

Motivation such as this will not, of course, make the least sense to the kind of man whose every activity is pointed toward money alone. Another man, who is perhaps rather scornful of the money-making motive as an end-in-itself, may, however, fail to grasp the justification for a motive which has no end of any practical kind in view. But the motivation in pure science which is based on pure curiosity requires no justification whatever. It stands on its own hind legs. It is self-sufficient. We want to know new facts because we want to know them. We are in this universe—there is a lot of it both in variety and quantity—and we are plain curious to know all we can know about it. That end is what actuates the majority of scientists—the woodchuck-Mrs. Jones motive: Man finding his place in the universe he lives in. It is satisfying to know our surroundings and feel that we are oriented in them, both physically and intellectually. What better off shall we be when we are? When your argumentative friend asks you this, what can you answer? Well, if he is still that impervious, there is probably no hope. He isn't worth the trouble. Cut and run.

Impressions and Comparisons

THE Fleet's in!

To many people—and some movie-goers in particular—these three words will have a certain cheery meaning. However, to pacifists, proponents of adequate national defense, students of international affairs (also friendships and animosities), and those interested in the limitation of armaments question, they will have a variety of conflicting meanings.

When more than 100 vessels of the battle and scouting forces steam into New York Harbor on May 31, for the first large concentration of our naval units in these waters for a number of years, the sight will be most impressive and inspiring. Nevertheless, pacifists, reds, and malcontents in general will seize the opportunity to rave—but let's not steal their thunder; these are all vociferous and will create their own din. Quieter, and also saner, serious-minded, eastern observers will have the opportunity to study, for the first time in a large group in which it is possible to make comparisons, old and new, obsolete and modern vessels in different categories.

Steaming past the President in review will move majestically the great battleships, among which will be the *Mississippi*, recently modernized (as described in detail on page 298) so that it is now one of the most up-to-date ships of its class afloat. Our 33,000-ton aircraft carriers will be there (as may also be our new 13,500 tonner). Old cruisers and the newer line of 10,000 ton craft, destroyers (*all* old, for they are of war-time vintage!), submarines, the airship *Macon*, and certain tenders and auxiliaries will salute the President and proceed to their anchorages.

On that day, we in the east will voice excited pride in this display of the nation's finest. When they've anchored, however, and we have time to study these protectors of our interests, these defenders of the people's rights, it is to be feared that a conscientious shame will overcome us; we have been lax in our naval building for so many years that these vessels are too few and some too old to symbolize truly the might of a great nation. We shall then confess our fault in hazarding the lives of heroic men in inefficient ships, and promise to remedy the matter by writing our congressmen to appropriate the money for our new naval building program. It is not too late to build a Navy that will keep us out of other people's impending wars!

"One-Eyed" Drivers

SPEAKING, as we have frequently in the past, of safety on the highways, there is one point often mentioned which, while small in itself, is of vital importance to safe motor-car driving. We refer to the operation of a car, after dark, with only one headlight burning or without a tail-light. For such negligence there is no excuse. Many states have laws intended to reduce this dangerous practice, but it continues nevertheless.

Drivers who operate a car with improper lights should consider that they are endangering not only the lives and property of others but their own as well. When a car on a dark road has only one headlight burning, it is impossible for an approaching driver to guess which one is dark. He tries to play safe and often misjudges his distance and runs off the edge of the road. Or he errs in the other direction and there is a more or less serious collision. All for the want of a small electric light bulb and a little thought on the part of a driver.

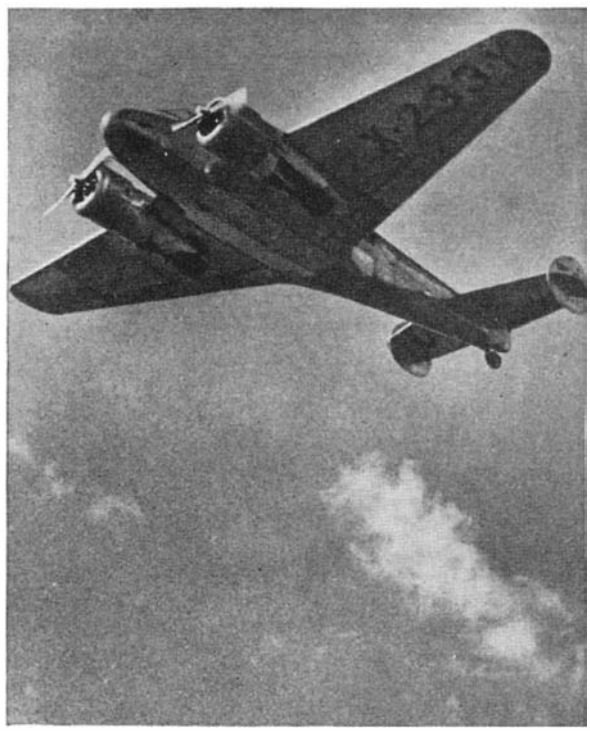
Progress in manufacturing methods has produced bulbs that are far more efficient and sturdy than those of the early days of electric systems on motor cars. Present-day bulbs are also low in price, and cost certainly cannot be a factor in the number of "one-eyed" cars on the road today. The bulbs are small and spares are easily carried; in fact, some states require that such spares be in the car at all times. It is perfectly apparent to the alert driver when one of his bulbs burns out. Thus we arrive at the fact that the dangerous practice of driving without proper lights is a matter of gross negligence. Such cases should be reported to the proper authorities, and they in turn should make every effort to promote highway safety by enforcing the requirements for proper lighting of automobiles.

AIRMAIL

By REGINALD M. CLEVELAND

American Air Transport Operators Have Built Up the Finest System of Its Kind in the World. "They Can Do Even Better if They Do Not Have to Play With Loaded Dice."

AT this writing an air transport system which was at once the wonder and the envy of the world is disrupted and threatened with disintegration. The airline operators, synonymous, broadly speaking, with the airmail contractors, have been invited to bid on 17,000 miles of routes which are substantially two thirds of the same routes which they were flying under contract up to February 9 of this year. They have been invited to bid on these routes on temporary contracts of three months' duration with two possible extensions of three months each, pending the completion of new "permanent" airmail legislation by Congress.



The Postoffice Department which issues this invitation surrounds it with conditions which make it so difficult as to be wellnigh impossible for any of the experienced, properly equipped companies to bid. No company may bid which lost its contract under the decision of February 9, by which all the contracts were annulled on the ground that there were fraud and collusion in their making. No company, bidding under the new temporary set up, may have an officer who was present at the alleged collusive conference of May 1930. No company may bid which is in association as a subsidiary or collateral company with any which is in the business of manufacturing aircraft or aircraft engines or accessories.

At the same time, bids have been asked in 15 days and operations under them are to start in 30 days thereafter, or a total of 45 days in which to organize and equip a major airline. Manifestly no new companies can successfully bid under such conditions.

THE requirement for a minimum cruising speed of only 110 miles an hour in the proposals for bids by private carriers on temporary contracts may be said to set back the pace of aviation by about five years. It means that obsolete equipment can be pulled out of hangars and put in service on airlines that have come to know average speeds from 150 to 190 and more miles an hour. These same proposals also permit the use of varying plane equipment on the same long route; three changes, from multi-motored to single-motored and back to multi-motored types, being permissible on a transcontinental run. In these respects the Postoffice rulings merely make a bad matter worse.

Payments, under the temporary contracts, are to range from 41 to 45 cents an airplane mile. There are to be no additional payments for the very things which led primarily to the development of the superb system of air transport which now lies prostrate—radio equipment, night flying, and flying over especially difficult terrain.

It is small wonder that one of the major operators, Richard W. Robbins, president of Transcontinental and Western Air, Inc., the "Lindbergh Line," has characterized the whole succession of events since the day of cancellation as a "crazy quilt, with each new patch more ludicrous than the last."

A dense barrage of statements has been sent up from Washington after each "new patch." In them nearly all phases of aviation, commercial and military, have been involved. It would be difficult to imagine a more astonishing series of misstatements and wrong inferences than have been found in the public prints on this subject. In the turbid smoke thus created, the bare facts of the air transport system in this country, as it existed before cancellation of the airmail contracts, have been almost completely obscured. Some of these facts are as follows:

THE airmail lines were flying an average of 151,019 miles daily—including the American owned system of Pan American Airways which continues to operate—and flying 124,154 miles of this total with mail. They were serving 170 cities in the United States with airmail. They were doing it at a net cost to the government which did not exceed 7,000,000 dollars a year. This represents the difference between the amount paid by the Postoffice Department for the carriage of mails under contract and the amount received by the same department in airmail postage.

By building up their other sources of revenue—the passenger and air express business—the airlines had been able to progress in speed, safety, regularity of service and modernization of equipment despite a constantly diminishing return from airmail sources. The government had been able to secure a faster and more widespread system of mail delivery at a constantly diminishing cost per mile.

Thus, in 1929 Postoffice Department payments averaged $1.09 a mile; in 1930, 98 cents a mile; in 1931, 79 cents a mile; in 1932, 62 cents a mile; in 1933, 54 cents a mile, and the estimate for the fiscal year of 1934 was 38 cents a mile.

Great Britain, Sweden, and Holland had all paid us the very tangible compliment of sending experts to study our air transport system. It was admitted to be the best, as it was by far the most intensively used, system in the world.

This system had been built up under the so-called Watres act; "an act to aid civil aviation." Operating under this act, the then Postmaster General, Walter F. Brown, had gone about the business

of building up an integrated system of airlines and of stimulating the carriage of passengers and goods in the same plane which carried mails.

Postmaster General Brown had a definite and concrete aim in mind. He decided that there should be three transcontinental systems and two main coastal systems, one on the Atlantic seaboard and one on the Pacific. He wanted those lines in each case flown for their entire length by planes under single management.

For this he had definite reasons. He sought to avoid the pitfalls of the short-line railroad; the little line beginning somewhere and ending nowhere. In the aggregate, such lines have cost the American public untold millions of dollars; untold thousands of heartbreaks. Their bonded indebtedness has sucked up savings in an amount which makes the entire investment in American aviation look like a game of penny ante. Mr. Brown did not want to see this mistake repeated in the young industry of air transport. He wanted also to save the costs of multiple overheads and the inefficiencies of frequent changes of ownership and the use of many types of equipment along the same airway. He was seeking an articulated system which could function swiftly and well. The Watres act gave him the right to make contract awards to the "lowest responsible bidder." He put the emphasis on *responsible* and he got the kind of system he was looking for.

It is not contended here that every award under the Brown administration was a wise one. There were doubtless some "extensions"—perfectly legal under the act—which were political in character and not justified by the business in airmail obtainable on the line thus set up.

The Postoffice Department, egged on by the Black Committee, has charged collusion and fraud in the making of the contracts. No one will question the propriety of punishing every instance of collusion or fraud which can be shown. The airmail contractors have asked, indeed have demanded, their day in court to answer any such specific charges. Thus far it has been denied. Thus far the charges have been not specific but general. The operators stand all tarred with the same brush. The government has refused to consent to suit. They have been referred—one can imagine with how unctuous a tongue in the cheek—to the court of claims.

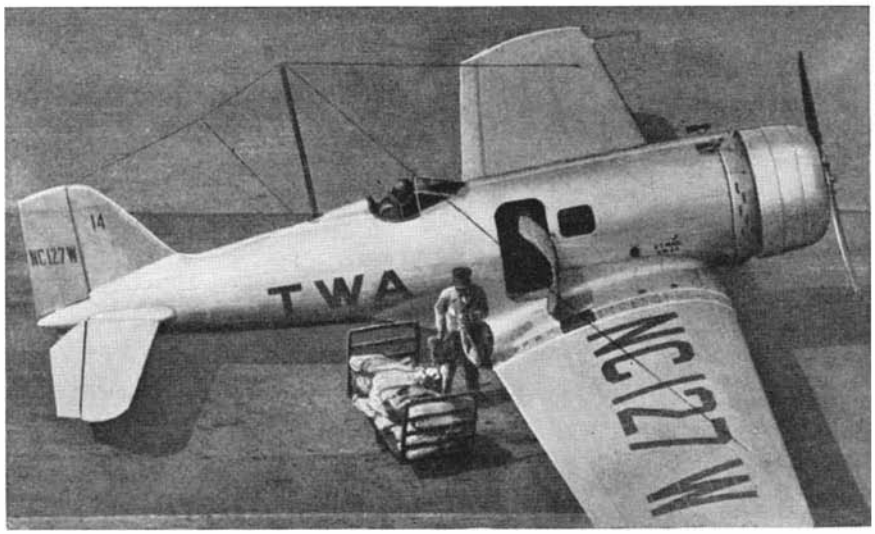
Ugly rumors, meanwhile, have had wide circulation as to short sales of aircraft stock in the days immediately prior to the cancellation of the airmail contracts. It would seem thoroughly worth while that these rumors be investigated, although it is a little idealistic to expect a Congress to pursue very ardently an investigation which might involve important personages in the majority party.

SUDDENLY, and as the tragic events proved, rashly, the Army Air Corps was ordered to fly the mails, on a limited schedule representing only a fraction of the daily service performed by the private lines. In characteristic Army style it took on the load and struggled gamely to carry the mail. In the first three weeks seven accidents cost ten lives of Army pilots, either flying the mail itself or making flights connected with its carrying.

Hotheaded supporters of the government policy rushed to point out that passenger plane crashes in the same period had cost more lives than the military ones. The period was marked by wretched flying weather; difficult alike for Army and civilian pilots. But the critics of the civil planes had forgotten the little matters of mileage flown and the number of accidents involved. The commercial losses came in two accidents; the military ones in seven. The civilian mileages for the period are not yet fully available but it is safe to say that they were at least four times those flown by the airmail service.

The Army was not to blame. The Air Corps fliers did not know the routes. They had been having an average of about four hours a month of flying as compared with 90 hours for the airmail pilots. The planes were not designed for mail load, carrying it, dangerously, back of the pilot in most cases, and the blind flying instrumentation, especially on the radio side, was not adequate because it was not intended for the purpose. But the tragedy remains.

Now the government would hasten to restore the mail to private contractors on a temporary basis and one which leaves them all—good and bad alike—under a like cloud of suspicion. They and the country have heard plenty of allegations of fraud and collusion. Now they want proof. If the transport operators can be assured of a real hearing, of an honest day in court, they will build anew. Last year they made a record of miles flown which compared with that of the next country in the world as 38 does to 4 or better than 9 to 1. They can do even better if they do not have to play with loaded dice.



A study in contrasts. *Right:* An Army plane converted to mail work by removing the equipment from the rear cockpit and using this space for the mail bags. *Below:* A Northrup Alpha of TW-A, with a special mail compartment forward of the pilot's open cockpit

RACE BETTERMENT BY

By J. H. LANDMAN, Ph.D., J.D., J.S.D.
The College of the City of New York
Author of "Human Sterilization"

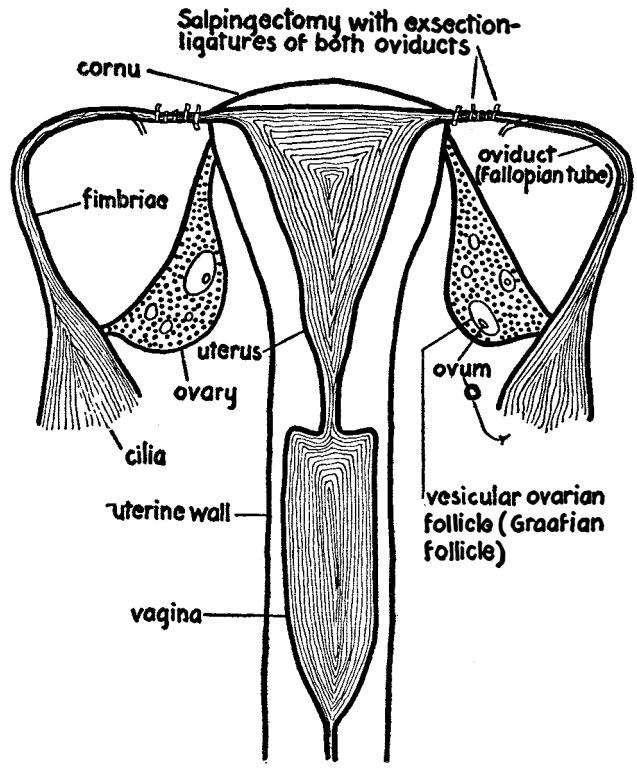
THE German human sterilization law which went into effect on January 2 of this year provides for the voluntary and compulsory eugenic sterilization of those Germans afflicted with one or another of such alleged hereditary diseases as hereditary feeblemindedness, schizophrenia, manic-depressive insanity, hereditary epilepsy, Huntington's chorea, hereditary blindness, hereditary deafness, serious hereditary bodily deformities, and alcoholism. According to semi-official reports emanating from Germany, 400,000 of these persons are to be sterilized with a view toward purifying the Nordic strain of the German people.

Of late, considerable discussion of eugenics and human sterilization has been evoked because of the scope of this law and the danger that it might be abused by subjecting the German Jews to sterilization not because of any hereditary malady of theirs but because of their race, though by all known scientific tests the Jews are a people of a high intelligence.

WHAT is human sterilization? Are castration and human sterilization alike? What effects has sterilization upon the individual, particularly on the sexual life? What people should be sterilized? What countries now practice compulsory human sterilization? What are their experiences with this type of legislation? These and many other questions come to mind as one cogitates about eugenic sterilization as a social therapeutic agency.

It is in the experiences of the United States with this legislation that one can find answers to these questions and it is in the United States that the question of population restriction and selection has been revived because of the chronic condition of unemployment in our midst.

Our country suffers to-day from an overproduction and an underconsumption of commodities, but also from a surplus reproduction of our population. As society is constituted at present, production, consumption, and population are not properly equated. Not that our country is too poor in natural resources and area to maintain its population. On the contrary, our country can support a still larger population. But one fifth of the population of the United States today is surplus—a mass of people that is socially unadjusted or maladjusted and that we can never altogether properly absorb into our social and economic life again. Many of these people are of such inferior quality that we should never want to incorporate them again into our society. These unfortunate people, many of whom are socially desirable and others socially undesirable, include the mentally diseased, such as the manics and the dementia praecoxes; the dependents, such as the unemployed, the deaf, the deformed, and the blind; the delinquents, such as the wayward and the criminals; the mentally deficient, such as the morons and the idiots; the degenerates, such as the sadists and the drug fiends; and the infectious, such as the tubercular and the syphilitics.



From Landman, "Human Sterilization," courtesy The Macmillan Company
Female sterilization consists of preventing the ovum from entering the uterus. This is called salpingectomy

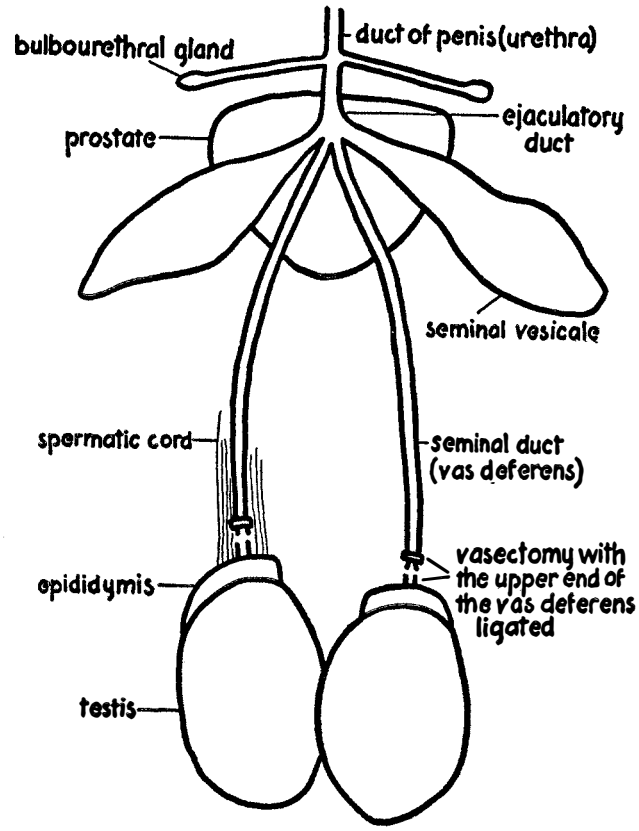
It is thus estimated that of the 125,000,000 people in the United States, over 25,000,000 are "misfit" or "unfit" and are unable to play properly their parts in society. The average number of patients in the hospitals of the United States in 1932 was 775,396. The total number of patients in the state hospitals for mental diseases at the end of 1930 was 323,688, a larger proportion than for any other group of institutions. The total number of patients in nervous and mental hospitals increased by 11,555 during the year 1930. The chance of anyone becoming insane, whether one be committed or not, is at least 1 in 10 at the present time. There were 64,253 feeble-minded and epileptics in state institutions in 1929. The state prisons had 116,670 inmates in 1930 and the federal prisons had 13,473 inmates in 1931. Between February 1 and September 30, 1932 as many as 207,694 arrests were made. Persons committed to prisons throughout the United States in 1931 numbered 70,966. The government is inclined to the opinion that there were about 100,000 narcotic drug addicts in the United States in 1932. According to the census of 1930, there were 63,489 blind and 57,084 deaf mutes in our country. Estimates vary but there must be about 10,000,000 unemployed in our country, 5,000,000 of whom will never again be absorbed in our present industrial life, according to President Franklin D. Roosevelt. It is no exaggeration then that there are 25,000,000 in the United States who are socially inadequate and who are a constant menace to our country and race.

Alarmist eugenists, such as Wiggam, Huntington, and Stoddard, have issued jeremiads with much eloquence, and sometimes with little evidence, of this impending self-destruction of humanity. They regard the dysgenic people as inimical to the human race. They believe that these people perpetuate their deficiencies and that we are bequeathing our civilization to the morons and the

HUMAN STERILIZATION

idiots. They contend also that, regardless of the acquisition or inheritance of certain bad physical and mental traits, there are numbers of habitual criminals and defective delinquents who should be prevented from procreating because they are manifestly unfit for rearing citizens of our new generation.

The optimistic eugenists are much more hopeful. They contend that the socially inadequate people are not multiplying more rapidly now than in the past. They believe that the actual number of these unfortunates has not increased and that the statistical increase is only apparent, due to a more critical and better diagnosis of these unsocial people and to a more frequent institutionalization of them. They believe also that modern society needs these people to perform the less intellectual and the more automatic work of our mechanical age.



From Landman, "Human Sterilization," courtesy The Macmillan Company

Male sterilization consists of blocking the tubes from the testicles. This is not castration but vasectomy

WHAT are the causes of this social pathology? Environmentalists and hereditists are divided as to the cause of this great social waste. Some social diagnosticians are more compromising and ascribe the evil to both environment and heredity. Sociologists with an economic leaning have accused the underconsumption, the overproduction, and the inequitable distribution of the wealth of our technological capitalism for our ever increasing army of unemployed and prescribe social planning, technocracy, or socialism. Among the many other environmental causes that might have contributed to the social inadequacy, bad associates, injuries at the time of birth, injuries to head during childhood, financial failure, disappointment in love, brain lesions, endocrine disorders and defective fetal development due to alcoholism, tuberculosis, syphilis, or malnutrition suggest themselves.

The hereditists, however, have been more convincing of late, primarily by exaggerating the scientific findings of eugenics. It is a young science and hence much that is myth, fable, or postulate passes for scientific fact. Our scant scientific eugenic knowledge has been prostituted to justify ancestor worship, race superiority, snobbery, class distinction, intellectual aristocracy, and race prejudice. What the science needs is more research and less propaganda. It is not true that boiler washers, engine hostlers, miners, janitors and garbage men, who have large families, are necessarily idiots and morons. It is not true that college graduates, people in "Who's Who," and some "successful" people, such as racketeers and bootleggers, are necessarily physically, mentally, and morally superior parents of our new generation. It is not true that celebrated individuals necessarily beget celebrated offspring. It is not true that idiotic individuals necessarily beget idiotic children. It is not true that the Jukes and the Kallikaks beget only criminal and idiotic children. It is not true that the Edwards family begets only superior children. It is not true that a mental trait, like high intelligence or idiocy, is transmissible in accordance with the Mendelian theory. It is not true that, because the color of guinea pigs is transmissible in accordance with the Mendelian theory, therefore human mental traits must also be transmissible in accordance with the Mendelian theory. It is not true that there are more children in the families in which both parents are idiots or feeble-minded than in which both parents are normal mentally. It is not true that, by any known scientific test, there is a Nordic race or that the so-called Nordic race is superior to any other race.

The belief that the population growth should be consciously controlled in the interests of all the people in the United States is widely entertained. This involves an effort to adjust numbers of people to the means available for their support, so that a high standard of living can be maintained. It means a development of methods of preventing the propagation of "the unfit" and in time, perhaps, methods of encouraging the propagation of "the fit" so as to improve the quality of the racial stock. Many find solace in the fact that our total national population has been increasing by lower decennial rates since 1860 and that the increase in numbers has fallen steadily and rapidly since 1923. Perhaps by 1950 our national population will become stationary and will even decrease after that date. But what of the socially unfortunates? Will they also decrease in numbers?

Among the several remedial measures, such as birth control, restrictive marriage laws, eugenic education, reorganization of our social and economic life, scientific breeding, painless peaceful death, *laissez-faire*, institutionalization, and others, alarmist eugenists advocate compulsory human sterilization. Their justification for this type of legislation is that many of these unsocial people have inherited their insufficiencies and are dysgenic, that is, potential parents of socially inadequate children, and the sterilization of them would necessarily prevent their propagation.

Twenty-seven states may legally practice human sterilization surgery in the United States to-day. Sixty-four different human sterilization laws have

been enacted since the legal inception of the movement in our country in Indiana in 1907. The first human sterilization act was introduced in 1897 in the Michigan legislature but it failed to be enacted. About 17,898 individuals have already been sterilized under the onus of this legislation. Many more individuals have been sterilized but these cases have not been recorded for fear of legal complications.

The United States is the pioneer in this movement and she is to-day the foremost champion and advocate of the cause in the world. In 1928 the province of Alberta in Canada, in 1929 Denmark, Finland, and the canton of Vaud in Switzerland, in 1932 the state of Vera Cruz in Mexico, and in 1933 Germany, espoused the cause. These foreign governments are the only other governments that have adopted this legislation. England, Norway, Sweden, and Western Australia are seriously considering adopting this social therapeutic agent at the present time.

The judicial history of human sterilization in the courts of the United States is interesting. Under the barrage of criticisms of religionists, humanitarians, and legalists, this legislation has run the gauntlet of the higher courts of the states. On eight different occasions, the respective state human sterilization laws were declared unconstitutional because they violated the Fourteenth Amendment to the Federal Constitution in that they denied "due process of law," and "equal protection of the laws" to all classes of people, and because the surgical operation was "a cruel and unusual punishment" and therefore constituted a violation of the state constitution.

IN ten instances the constitutionality of the acts was upheld. Especially has this been true since the eventful *Buck v. Bell* decision of May 2, 1927 in the United States Supreme Court. The court held unequivocally that the Virginia state law, authorizing the sterilization of mental defectives and others, under careful safeguards, is not void under the Fourteenth Amendment to the Federal Constitution since Carrie Buck was given an adequate trial and that she was not discriminated against arbitrarily as over against similar hereditary idiots at liberty. The early sterilization operations were usually castrations or the corresponding ovariotomies and hence the early court decisions declared them to be "cruel and unusual punishments" and therefore illegal. With the advent of vasectomy and salpingectomy, this legal difficulty is eliminated. Vasectomy is a simple minor operation which provides for the cutting and the ligating (tying off) of both sperm ducts, thus preventing the emission of the sperm. Salpingectomy is a similar operation except that both oviducts are cut and ligated, thus preventing the entrance of the ova into the womb. Surgeons have not been successful in making either operation reversible. Patients experience as little pain as if they had a tooth extracted and convalesce completely in several days. By virtue of this Federal Supreme Court decision, many new human sterilization laws were enacted.

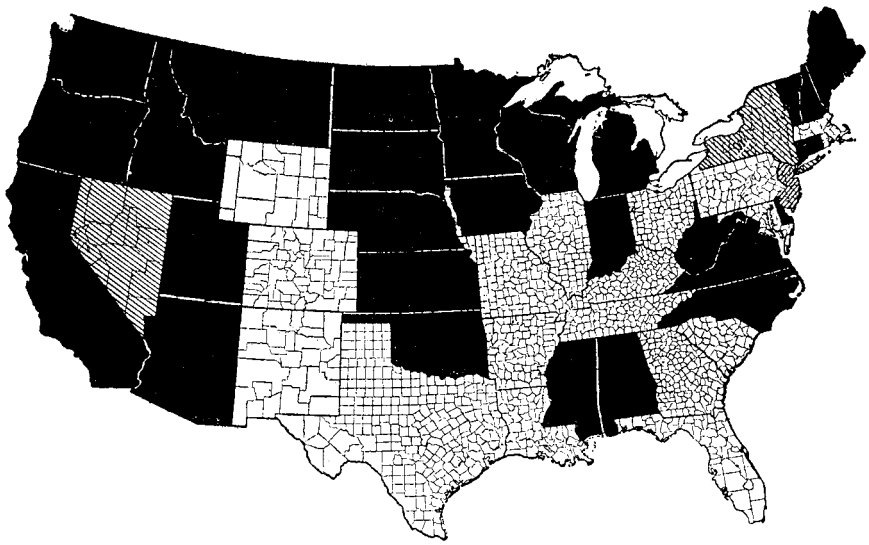
The dependents, such as the unemployed, the deaf, the deformed, and the blind; the delinquents, such as the wayward and the criminals; the degenerates, such as the sadists and the drug fiends; and the infectious, such as the tuberculars, the syphilitics, and the lepers need not engage our attention. Most eugenists are in accord that their insufficiencies, *per se*, have been largely acquired or learned rather than inherited, and that these unfortunates should not be subject to coercive human sterilization. It is in regard to the two chronic and malignant groups of patients, that is, the mentally diseased, such as the maniacs and the dementia praecoxes, and the mentally deficient, such as the morons and the idiots, that there is considerable controversy concerning their causes. The question is still mooted. Its solution is fundamental to any constructive program for human sterilization. Yet most of the sterilization patients have been from these two categories.

More eugenists are in agreement that psychoses or mental diseases are acquired rather than inherited but the preponderance of opinion is in favor of the theory that the mental deficiencies are inherited. Nevertheless, the answer to the problem of the hereditability of

STERILIZATION LAWS IN THE VARIOUS STATES

States	*Date of First Law*	*Citation of Law* (b)	*Citation of Adjudications*	*Nature of Decision*	*Number of Sterilizations to Jan. 1, 1935*
Indiana	1907	Laws of 1907 Chapter 215	Williams v. Smith (1921) 190 Ind. 526	unconstitutional	385
California	1909	Statutes of 1909 Chapter 720			9,782
Connecticut	1909	Acts of 1909 Chapter 209			338
Washington	1909	Sess. Laws 1909 Crim. Code Sec. 35	State v. Feilen (1912) 70 Wash. 65	constitutional	30
Iowa	1911	Acts of 1911 Chapter 129	Davis v. Berry (1914) 216 Fed. 413	unconstitutional	94
Nevada	1911 (a)	Rev. Laws of 1911 Par. 6293, Sec. 28	Mickel v. Heinrichs (1918) 262 Fed. 688	unconstitutional	0
New Jersey	1911 (a)	Acts of 1911 Chapter 190	Smith v. Board of Examiners of Feebleminded (1913) 85 N. J. L. 46	unconstitutional	0
New York	1912 (a)	Laws of 1912 Vol. II, Chap. 445 Article 19	In re Thomson, 169 N. Y. Supp. 638 (1918)	unconstitutional	200
			Osborn v. Thomson, (1918) 171 N. Y. Supp. 1094	unconstitutional	
Kansas	1913	Sess. Laws 1913 Chapter 305	State v. Schaffer (1928) 270 Pac. 604	constitutional	976
Michigan	1913	Acts of 1913 Act No. 34	Haynes v. Lapeer (1918) 201 Mich. 138	unconstitutional	1,083
			Smith v. Command (1925) 231 Mich. 409	constitutional	
			In re Salloum (1926) 236 Mich. 478	constitutional	
North Dakota	1913	Laws of 1913 Chapter 56			97
Wisconsin	1913	Sess. Laws 1913 Chapter 693			492
Nebraska	1915	Laws of 1915 Chapter 237			451
New Hampshire	1917	Laws of 1917 Chapter 181			167
Oregon	1917	Laws of 1917 Chapter 279	Cline v. Oregon State Bd. of Eugenics (1921)	unconstitutional	882
South Dakota	1917	Laws of 1917 Chapter 236			139
Alabama	1919	Laws of 1919 Act No. 704, Sec. 10			131
North Carolina	1919 (a)	Laws of 1919 Chapter 281	Brewer v. Valk (1933) 204 N. Car. 186	unconstitutional	46
Delaware	1923	Laws of 1923 Chapter 62			296
Montana	1923	Laws of 1923 Chapter 164			81
Virginia	1924	Laws of 1924 Chapter 394	Buck v. Priddy (1925)	constitutional	1,333
			Buck v. Priddy (1925) 143 Va. 210	constitutional	
			Buck v. Bell (1927) 47 Sup. Ct. Rep. 584	constitutional	
Idaho	1925	Laws of 1925 Chapter 194	Board of Eugenics v. Troutman (1931) 299 Pac. 668	constitutional	13
Maine	1925	Laws of 1925 Chapter 208			41
Minnesota	1925	Laws of 1925 Chapter 154			693
Utah	1925	Laws of 1925 Chapter 82	Davis v. Walton (1929) 276 Pac. 921	constitutional	85
Mississippi	1928	Laws of 1928 Chapter 294			12
Arizona	1929	Acts of 1929 Chapter 44			20
West Virginia	1929	Acts of 1929 Chapter 4			1
Oklahoma	1931	Session Laws of 1931, Chapter 26, Art. 3	In re Main (Okla.), 19 P. (2d) 153 (1933).	constitutional	0
Vermont	1931	Acts of 1931 No. 174			30
				Total—	17,898

(a) No statute now in force.
(b) Legal data taken from *Human Sterilization*, by J. H. Landman, Appendix C.



STERILIZATION LEGISLATION IN THE UNITED STATES TODAY

the mental deficiencies is still conjectural. The psychotics or the mentally diseased have few children because they are comparatively short-lived, and they lack sexual attraction. The perniciousness of it all is that most of the psychotics are born of normal or apparently normal parents who are latent carriers of mental disease. Here too, the menace to society is not the obviously mental deficient but the individual who is a latent carrier of mental deficiency in his or her germ plasm. In recent years experimentalists, especially educationists, have been busily engaged trying to establish the relative importance of the rôles of nature and nurture in both low intelligence and high intelligence, but in vain. If anything, the controversy to-day is further from solution than it ever was, especially with the advent of the behavioristic psychology and its emphasis upon the environment as a factor in intelligence.

AS for the therapeutic value of the human sterilization surgery of vasectomy or salpingectomy, the literature is meagre, cursory, and frequently prejudicial. The California studies would seem to lead to the conclusion that the sterilization surgeries of vasectomy or salpingectomy do not unsex the patients or noticeably change their sex lives, and improve their health. Other reports would lead to a contrary conclusion. In a California study, it was found that about one third of the married people who were sterilized were unhappy for various reasons. This proportion would have been perhaps larger among mentally normal people.

Of the various classes of socially inadequate people who are subject to the human sterilization legislation of the present, the feeble-minded, the idiots, the insane, the epileptics, and the imbeciles are most frequently included. It should be so since these classes of mental ailments display the greatest proof of inheritance, though perhaps not altogether conclusively. Yet other classes of people, such as prostitutes, convicts of at least two felonies, drug fiends, and sodomists are subject to compulsory sterilization, though, in accordance with the better scientific information, these people suffer from ailments that are acquired and may well be cured or arrested during their lifetimes. It might be mentioned that these classes of people are rarely included.

The execution of the various human sterilization laws reveals a glaring discrepancy between science and fact. In 15 states reporting, 6246 compulsory sterilization operations were performed on insane persons, 2938 on feeble-minded persons, 55 on persons suffering from epilepsy, 16 on criminals and 5 on those suffering from nervous disorders. About twice as many operations were performed on the insane as on the feeble-minded. Yet, all eugenists would agree that feeble-mindedness is much more hereditary than insanity and criminality. The number of operations on the feeble-minded should have exceeded that of the insane.

Only the statutes of California, Nebraska, South Dakota, Oklahoma, West Virginia, and Maine provide for the sterilization of inmates of institutions who are about to be paroled or discharged. All other sterilization acts make no such provision. Unless the sterilization operation has a therapeutic effect on the patient, there seems to be no justification for the operation. Its therapeutic value, as already indicated, is conjectural. Unless we can restore these sterilized people to society, why sterilize them? The eugenic justification for the sterilization of custodial inmates is not tenable.

What seems even more unreasonable is the fact that the sterilization acts apply primarily to mental patients in institutions when the alleged menace to society is the presence of these mental patients at large. Only Delaware, Iowa, Maine, Michigan, New Hampshire, North Carolina, Oregon, South Dakota, Vermont, and Indiana statutes provide for the sterilization of their selected dysgenics at large. Of course, it is, as a practical proposition, difficult to reach these people at liberty. Nevertheless, state agencies ought to be established in order to bring them into the pale of the law.

IN several institutions for the insane in California, there were about 1000 institutionalized insane in the year 1927 suffering from dementia praecox and manic-depressiveness. After two years of institutionalization subsequent to the performance of the sterilizations, 67 percent of the males and 79 percent of the females, of those sterilized insane inmates who were studied, were still institutionalized. In a study of 605 case histories of the feeble-minded in the same state, 34 percent of the males and 28 percent of the females were still institutionalized. Advocates of human sterilization urge in behalf of the cause that it is not only an agency for race betterment but that its therapeutic value is so great that many of these people can be restored to society successfully and with impunity. These California studies are adduced to bear out this contention. Is the successful return to society of the feeble-minded patient due to the effects of the surgery or due to the conditioning, the vocational training and the psychotherapy the patient received in the institution? The results of Fernald, Mathews, Potter, McCollister, and Bernstein, with their psychotherapy, occupational therapy, medication, diet and the like, have been equally as good as those in California. Their patients are paroled or discharged whenever they show the proper emotional and mental constitution, which condition may really be the fundamental cause for the successful return of the sterilized or non-sterilized mental patients to society. The question of the eugenics of mental traits needs more research than speculation!

●

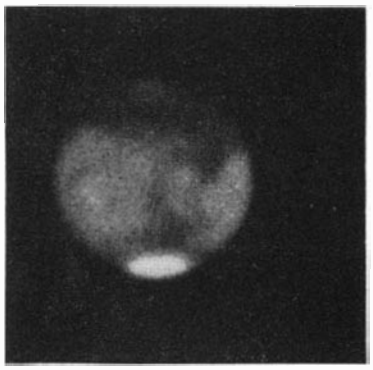
A second article on human sterilization will follow next month, and a third, representing the opposing point of view, one or two months later. —The Editor.

Fading Belief in

LIFE ON OTHER PLANETS

By HENRY NORRIS RUSSELL, Ph. D.
Chairman of the Department of Astronomy and Director of the Observatory at Princeton University
Research Associate of the Mount Wilson Observatory of the Carnegie Institution of Washington
Retiring President of the American Association for the Advancement of Science

"THE earth's atmosphere is the astronomer's black beast." This literal translation from the French which the writer's old teacher, Prof. C. A. Young, used to quote with enjoyment is only too true. Half of the time (in our part of the country, at least) the atmosphere is cloudy. More than half of the rest it is so full of streaks and currents of uneven density that no fine detail can be seen through



A direct photograph of Mars taken at Lowell Observatory, by Slipher

it with the best of telescopes, and all of the time the ozone in its upper regions obscures the most interesting part of the spectra of the sun and the stars. It is by far the most active part of our planet, not only in bothering the astronomers but in more important ways.

The earth's atmosphere constitutes slightly less than a millionth part of the earth's whole mass and only 1/280 that of the ocean. But the rain which falls from it every century weighs seven times as much as the air itself. Three quarters of this falls back into the sea. Even so, the work of the weather amounts to pouring all the water in the oceans over the land once in every 12,000 years. Almost three quarters of this rainfall again evaporates. The rest runs back in the rivers, and the whole volume of the ocean has done this at least 30,000 times during the known duration of geologic history and washed down sediment enough to fill a quarter of the present ocean basins.

During this oft-repeated process the waters have dissolved from the rocks most, if not all, of the stuff which makes sea water salt and bitter. The atmosphere has been the vehicle of this enormous turnover. Has anything happened to it, too?

If the wearing away of rocks were accomplished by mere mechanical attrition the air would have nothing to do but to carry the water. But the greater part of rock weathering is a chemical process. The more easily attacked minerals are decomposed, leaving the resistant ones, such as quartz, to be pounded into sand. The principal reaction is the formation of soluble carbonates or bicarbonates of calcium, magnesium, and the alkali metals. These go down the rivers into the ocean, the sodium to stay and make the sea salt, the calcium and magnesium to be precipitated as limestone and dolomite (usually by organic action) and the potassium, strangely enough, to be adsorbed by mud and clay so that very little of it remains in the sea water.

ABOUT 8 percent, by weight, of the original eruptive rocks is dissolved in this way (according to Goldschmidt, from whose very interesting paper this account is taken). A great amount of carbon dioxide is consumed in the process. There is very little of it in the rocks—almost all must come out of the atmosphere. When the dissolved material enters the sea and the limestone and dolomite are formed, about one half of this carbon dioxide is liberated again. The rest is buried in the sedimentary rocks.

The amount which has thus been interred, according to Goldschmidt's calculations, is *15,000 times* as great as that which is now present in the atmosphere (forming but 1/2500 of the whole). There is 50 times as much dissolved in the sea as there is free in the air. The latter, if it could all be precipitated in the snowy form (dry ice), would make a layer less than a quarter of an inch thick. Without this saving remnant our planet would be a dead world. From the carbon dioxide of the air and with energy derived from sunlight, green plants, the most wonderful of all nature's laboratories, build up the complex compounds which form food for themselves and for all living things. The oxygen, which is the breath of life to an animal, is only a by-product of this fundamental process. There are so many living things on earth, and so little carbon dioxide in the air, that the whole of it must pass through some form of living matter every few years. Much of it, of course, is returned to the air very quickly, by the breathing of animals and the burning or decomposition of vegetable matter. A small part is locked up for centuries in such forms as wood and peat, and a still smaller amount of organic matter gets buried, turns gradually into coal or oil, and is lost to change for ages.

Except in the last case the oxygen liberated in photosynthesis is used up again in the various reverse processes, but the fossil organic matter is withdrawn from the cycle and must be bal-

Venus, photographed with 12-inch telescope, by H. A. Lower, amateur

anced by a gradual accumulation of oxygen in the atmosphere. The suggestion that the present supply of oxygen has all been produced in this way is a century old. Recent studies confirm it, showing that the amount of fossil organic matter required to balance it amounts to only 1/2000 part by weight of the sedimentary rocks—a quite plausible amount.

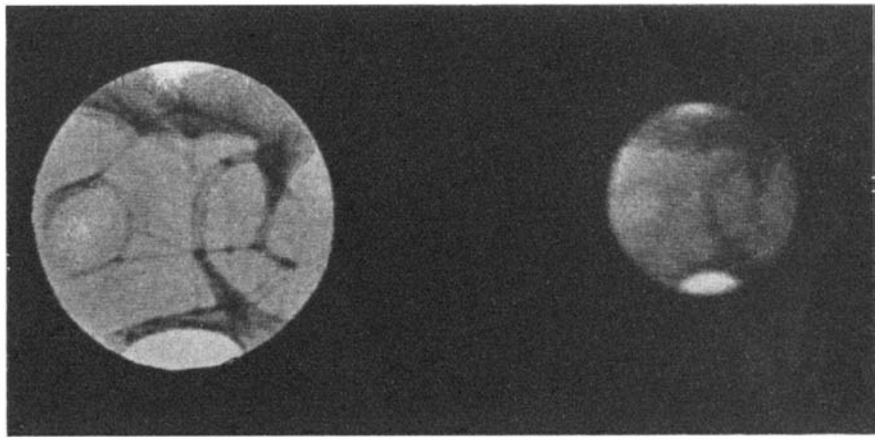
Rock weathering, however, affects atmospheric oxygen as well as carbon

dioxide. Fresh eruptive rocks are usually darkish in color, grey or even black, owing to the presence of minerals containing iron in its less oxidized or ferrous state. During weathering these take on 50 percent more oxygen and turn to ferric compounds characteristically yellow or red in color. The yellow sands of the Sahara, the red rocks of the Painted Desert, and even the red clay of the ocean depth, owe their colors to the process of oxidation. Though slow, it is steady, and the loss of oxygen is irretrievable since, so far as we know, the change is scarcely ever reversed. Goldschmidt calculates that the total amount of "fossil" oxygen thus lost to the atmosphere must fully equal all that remains, and may be twice as great. This oxygen, too, must be balanced by organic matter in the rocks and, so far as the evidence goes, it well may be.

Rock weathering is still going on. If it continues at the present rate it might exhaust all the oxygen of the atmosphere in another billion years or so. Will life on earth end then? The fear is a bit remote, in any event, but it may be groundless. The enormous quantity of carbon dioxide now locked up in limestone must have gone through the atmosphere, but it could not have been all there at the start, for it amounts to seven times the present mass of the whole atmosphere—enough to raise the atmospheric pressure to 120 pounds per square inch. Some of it would have gone into the sea, but not enough to save the situation and make either sea or land habitable for such organisms as we know were there.

THE alternative is that the carbon dioxide has been added to the atmosphere bit by bit in the course of geologic time. Volcanoes emit enormous quantities of this gas, most of which doubtless comes out of the molten magma, deep down in the earth, and has never seen the light before. The average amount of this "juvenile" carbon dioxide which would have to be added each year to provide for all the limestone, is a hundred thousandth part of that which is now in the atmosphere, or 15,000,000 tons. The amount of the gas released yearly by the burning of coal and oil in human industry is more than 200 times as great!

In the long run, 90 percent of this carbon dioxide has gone into the limestones, 10 percent has been decomposed by plants into oxygen, and about a third of one percent remains free, mostly in the sea. The plants have so far kept well ahead of the red rocks—providing as much oxygen again as the rocks devoured. So long as the sun shines and the earth's volcanoes are active, the fear of a gradual suffocation of animal life may be laid aside. Should the worst come to the worst a race of no higher intelligence than present-day humanity could probably preserve its existence, though in diminished numbers; living, for example, in spacious glass-roofed enclosures supplied with artificially generated oxygen and growing its own food inside them if it would not grow elsewhere. The most severe demand upon their intelligence would be to take any steps at all to meet so very gradual a change in conditions.



Left: **A drawing of Mars made at Lowell Observatory through a 24-inch telescope and,** ***right,*** **a photograph of this same drawing made through the same telescope. Compare with direct photograph on opposite page. Why the vast discrepancy between drawing and photograph? The drawing is a composite of thousands of fleeting glimpses between times when atmosphere blurs visibility**

But what has all this—fact or fancy—to do with astronomy? Turn our spectroscopes on the nearest planets and we are answered. Adams and Dunham have found that Venus shows no trace of the familiar bands of oxygen or water vapor, even when her distance is changing most rapidly and lines produced in the planet's atmosphere would be shifted by the Doppler effect and brought to one side of the lines produced in our own atmosphere. But there are three beautiful bands in the deep red and infra-red which have been definitely traced to carbon dioxide. In the laboratory they are very weakly absorbed; to get them as strong as they are in the planet would require the equivalent of a layer of gas at least a quarter of a mile thick at standard temperature and pressure, which is fully 150 times as much as there is in the earth's atmosphere. This is the amount above the layer of clouds or haze which forms the planet's visible boundary. There may be much more below.

Such an atmosphere would exert a powerful "greenhouse" effect, letting the short waves of sunlight in and retarding the escape of the long waves from the warm surface. Wildt, one of the best men working on the subject, concludes that the temperature at the planet's surface may be as high as the boiling point of water. Life could hardly maintain itself under these conditions, and in its absence the carbon dioxide would remain in the atmosphere. Why there is no water vapor is a great puzzle—the surface must be bone dry. Wildt suggests that all the water has gone into some sort of chemical combination or hydration, but it is hard to see how this could happen if there had ever been anything like the amount that there is in our oceans.

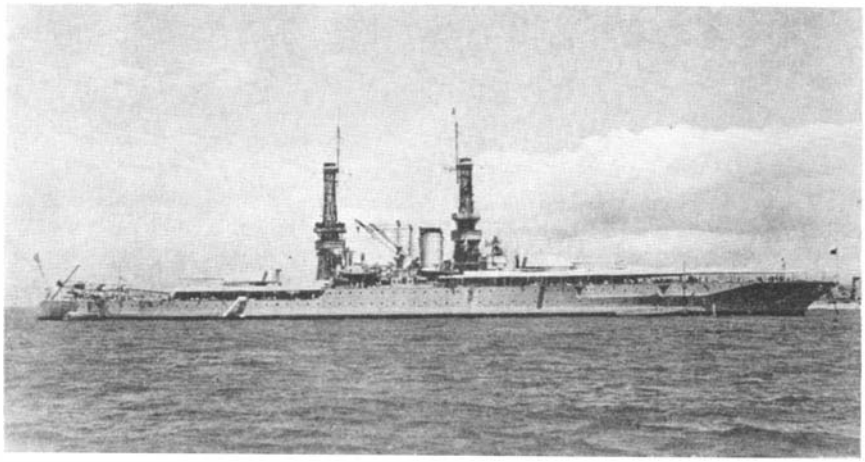
Mars, too, shows no traces of oxygen, water or carbon dioxide. The test for the last is insensitive and its failure does not mean much. That for water vapor is not delicate enough to refute the belief based on thermal evidence, that the polar caps are actually composed of snow evaporating below the freezing point under low pressure. But oxygen must be present in very small amounts, if at all—not more than a thousandth part as much as on earth. Whether there is any now or not, the red color of the planet's surface is very strong evidence that it was there once. Atmosphereless bodies like our moon show not a trace of red anywhere on their surface. The color of Mars is exactly that of an oxidized surface and there can be little doubt that ferric iron is actually to blame for it. May it not be that rock weathering has done its deadly work on Mars and depleted its atmosphere of oxygen? If the oxygen was of vegetable origin, there was once life on the planet. We cannot be too sure that it is not there still, for the exhaustion would be so slow that evolutionary processes might well be able to follow it, producing plants which conserve oxygen as terrestrial desert plants store up water.

IT seems, then, that Mars may represent a far later stage in the history of a planet than the earth, while Venus somewhat resembles the earth before life developed upon it—and we find ourselves, like the planet we live upon,

"Wandering between two worlds, one dead,
The other powerless to be born."

—*Princeton University Observatory*

MODERNIZING THE



The *Mississippi* as she was before modernization. The most noticeable feature, which she possessed in common with our other battleships, is the "basket-masts"

By W. D. PULESTON
Captain, U. S. N., Commanding the *Mississippi*

IT will be easy for city dwellers, particularly New Yorkers, accustomed to subway building, house-wrecking, and sky-scraper construction, to visualize the general problem confronting the naval engineers and constructors who modernized our battleships. Those who have seen civil engineers shore-up a many-storied building while they routed a subway tunnel through its former basement, can readily imagine the similar problems that confronted our naval constructors and engineers in shoring up decks with temporary stanchions while an additional superstructure was being installed. Yet it will probably surprise most city dwellers as well as country folk to learn that modernizing battleships was a familiar process to their sea-going European ancestors.

In the days of wooden ships, modernizing old men-of-war was the usual method of keeping a fleet up-to-date. In that era the cost of labor was low, but new construction was very expensive because of the cost of wood which was the only building material available to the shipwright. Furthermore, because of the poor roads, overland transportation of this bulky raw material was extremely costly, and as the forests near the European coast line were gradually depleted, the cost of masts and ship's timber forced impecunious kings, whose purses paid for the royal navies, to rebuild old vessels rather than to construct new ones.

The shipwrights' tools—the saw, the adze, and the axe—were equal to ripping into the wooden hulls, cutting out and replacing the rotted timbers and decayed knees. And with the adze the skilful ship's carpenter could scarf the ends of two timbers until they dovetailed neatly into one. The "tree-nails," large wooden pegs or nails, completed the union.

The reason for modernizing *our* battleships was not the dearth of building material, but the prohibition against constructing new battleships contained among the provisions of the Washington Conference of 1921-1922. This prohibition bore particularly hard on our Navy, because we scrapped ships under construction and nearing completion which embodied the lessons of the battle of Jutland, while we retained battleships dating back to the *Delaware* and *North Dakota*, our first dreadnoughts.

IN many ways, modernizing a battleship gave the constructor more difficult problems than new construction, just as building a subway under a city involves more intricate engineering problems than constructing a new railway. In fact the task of modernization would have been impracticable except for certain modern inventions and mechanical processes, notably those of "burning" and "welding."

The modern artisan has substituted his "burner" for the shipwright's saw. He burns off steel stanchions, bulkheads, and decks until he has laid a ship wide open for the rebuilding processes. The intense heat of his flame cuts through iron and steel more rapidly than the shipwright's saw could rip into the oaken timbers of the old ships-of-the-line.

But modern artisans use heat to rebuild as well, and they weld together the severed members they have so ruthlessly burned apart. Their uncanny ability to burn "together" or to burn "apart" would certainly have subjected them to trials for witchcraft had they plied their trades in Salem during the days when that city was fostering the infant shipbuilding industry in our country.

In modernizing the *Mississippi* it has been roughly estimated that an average of 50 welders were employed on the ship every working day for a period of two years. A very small portion of this welding was done by the acetylene process; much the largest part was done by arc-welding. Besides a host of minor items such as welding hooks, brackets, and small fittings throughout the ship, these welders made possible the installation of new bulkheads, plates, stanchions, and special foundations for guns and machinery.

PERHAPS the most interesting type of welding on the *Mississippi* was that done in welding the longitudinal and vertical seams of the "blisters." The reader will appreciate this task better if he is reminded of the necessity for and the origin of the blister.

Two formidable enemies of modern battleships are mines and torpedoes. Both of these attack the ship's underwater body where the battleship was formerly least protected and where a hole in the ship would cause the most serious consequences. Prior to the World War designers generally contented themselves with furnishing a ship with a double-bottom as protection against underwater damage. Since the battle of Jutland, designers have added the equivalent of a third bottom and in addition carried this new steel framework as a "void" or empty compartment up the sides of the ship from just above the keel to the armor shelf.

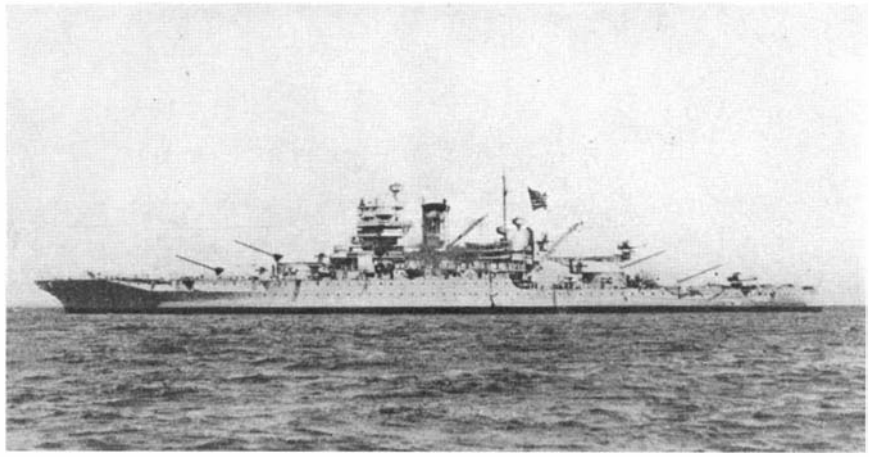
The theory of this new structure is that the mine or torpedo will explode outside and exhaust most of its destructive force in the new void before it

The opinions and the facts in this article are the personal ones of the writer. They are not to be construed as official or reflecting the views of the Navy or the Navy Department.

U.S.S. 'MISSISSIPPI'

reaches a vital part of the ship. These new bottom and side voids were built within the outside skin of the ship in new construction such as in the latest British ships, the *Rodney* and *Hood*. The space available inside the old battleships being renovated did not permit the constructor to build interior voids, so in modernization the voids were built outside the skin of the ship and these bulges were promptly christened "blisters" by sailormen.

These blisters, which in appearance somewhat resembled pontoons with one side removed, were fabricated in the Navy Yard shops and secured to the ship's side by means of vertical angle-irons previously welded to the old skin of the ship. The *Mississippi* is 624 feet long, and as the blisters cover approximately three quarters of the ship, it is apparent that placing the blisters was an extensive operation.



The first glance at the modernized *Mississippi* shows the final disappearance of masts from battleships and in their place structures resembling pagodas

THESE blisters were made in sections 15 to 20 feet long; they were required to fit neatly around the curving side of the ship. The necessary measurements were obtained from the ship itself by using large curved wooden patterns; these patterns were then used in the shop to cut the steel frames to the right sizes. Welding permitted a small leeway for errors, but these blisters when fabricated were exceedingly accurate and most of them fitted snugly.

Along the middle or "waist" of the ship, the inside frames of the blisters had approximately the same curvature, but as the blisters approached the bow and stern, the shapes of these inside frames changed rapidly in order to "fair up" the structure and preserve the "ship-shape" underwater body. This required close calculation by the designers and accurate workmanship in the shop. And the proof of the success is demonstrated by the fact that the maneuvering qualities of the modernized ship have not been reduced by the addition of the blisters.

After the blisters were fabricated in the shops they were loaded on flat cars and placed abreast the ship in dry dock. They were then swung into position by traveling cranes and connected to the outer hull by means of vertical angles previously welded to the skin of the ship. The plates of the blisters, forming the new bottom plating, were then welded where they abutted.

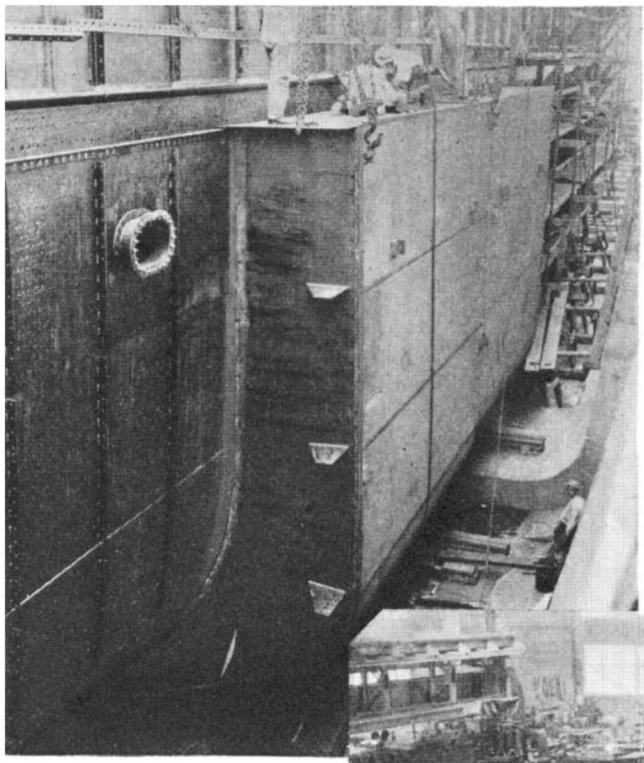
Arc welding with bare and covered rods was used to a great extent on new bulkheads throughout the ship, "T" welds being made where the plates met the deck or the overhead, and plain or "joggled" laps, welded on both sides, were formed vertically. In many cases, to facilitate or make possible access for various materials, passages were cut in bulkheads by acetylene torches and later closed by arc welding. The edges of the plating around such openings were beveled to about 45 degrees by chipping or grinding, and the "V" so formed was filled by welding.

During modernization, it was necessary to shorten a number of stanchions. This was accomplished by cutting a section out of the stanchion, butting the two parts and fillet-welding two curved straps (wrapper bands) over the joints. This process suggests the way sailormen "fish" a mast or spar. Space was left between the straps to make the vertical welds. While this method did not improve the appearance of the stanchions, there is no question of the strength of the joint or the economy of the operation.

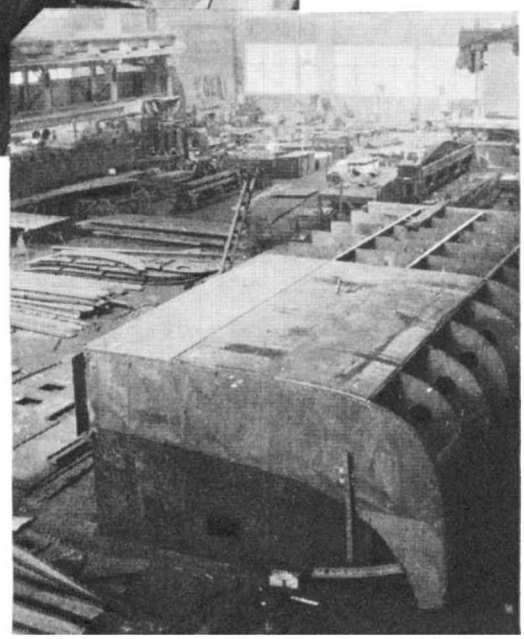
While the mine and torpedo were primarily responsible for the blisters, the improved seaplanes caused most of the other alterations effected during modernization. Most of us think of aviation only as the enemy of the battleship, yet every American battleship carries three to four planes. Without these planes, extreme battle ranges would be roughly 20,000 yards, because beyond that distance the fire of the guns could not be effectively controlled from the "fighting tops," and there is no advantage gained by shooting blindly in the general direction of the enemy.

Space inside any turret has always been scarce. When the additional elevation was obtained, it necessarily meant that the breech of the gun was correspondingly depressed, and this required more space. To meet this demand taxed the ingenuity of the ordnance designers. Yet they overcame this and other similar obstacles. Speaking in the most general terms, it was modern industrial development that enabled the designers to find the extra space. For example, a 50 horsepower motor of 1933 was much smaller than its 1917 ancestor. So by substituting the smaller for the older and larger electrical machines, and by skilful rearrangement of the interior of the turret, the extra space required by the new elevation was obtained without enlarging the exterior dimensions of the turret. When the proposal to elevate to 30 degrees was first made, the ordnance designers were doubtful whether that elevation could be obtained. During the modernization when the turret machinery was being installed, it frequently appeared to be a physical impossibility. But it was successfully done and now after completion the interiors of the turrets appear comparatively roomy.

ONE effect of modernization was to increase the displacement of the *Mississippi*. As the same general underwater body was preserved, this meant that increased horsepower was necessary; otherwise the speed was reduced. The Bureau of Engineering met this requirement by installing six new boilers which are really extremely fast steam generators. "Boiler" is a misnomer for a modern steam-producing



Attaching two shop-fabricated blister sections to the hull of a battleship. These sections must fit snugly all the varying underwater curves of the hull



Method of shop-assembly of all-welded blister sections for the *Mississippi*. View of the outside of two of the lower sections

apparatus that almost instantly converts water into steam. There isn't a vestige of the old method of raising steam by gradually boiling water remaining in this new type steam generator.

These boilers were designed by the Bureau of Engineering and built at the Norfolk Navy Yard. After construction they were taken down in three main parts and set up a second time on the foundations or "saddles" built into the ship.

To transform this steam into useful propulsive energy, the Westinghouse company furnished four of its marine turbines with the usual reduction-gears to reduce the revolutions required of the shaft and propellers. By using turbines of modern design, the sizes and weights of these four engines were much reduced.

The propellers and shafting of the four engines were unchanged during modernization and apparently revolve as readily for the new engines as they did for their former ones. The design of propellers has been given much study by design engineers. Naval architects and engineers are working continuously on the problem of ship-propulsion but there is surprisingly little improvement. In fact, with all the advances made in marine engineering and hull-design in the past 30 years, the co-efficient of propulsive efficiency of modern steamers is still low. In 1900, the ratio of useful propulsive energy to the total heat energy in the fuel consumed was between 7 and 8 percent. Today, with propellers driven by external combustion engines it scarcely equals 10 percent.

Making due allowance for the inefficiency of external combustion engines and the inherent difficulties of driving a ship through the water, it does seem that greater efficiency should have been attained when we consider the progress that has been made in other fields of activity. Perhaps some readers of SCIENTIFIC AMERICAN will turn their minds to the problem of vessel-propulsion and effect some improvement! There is room for a great deal. But do not think the problem is an easy one and send in hastily-considered designs to already hard-worked designers. Devote some real thought to the matter.

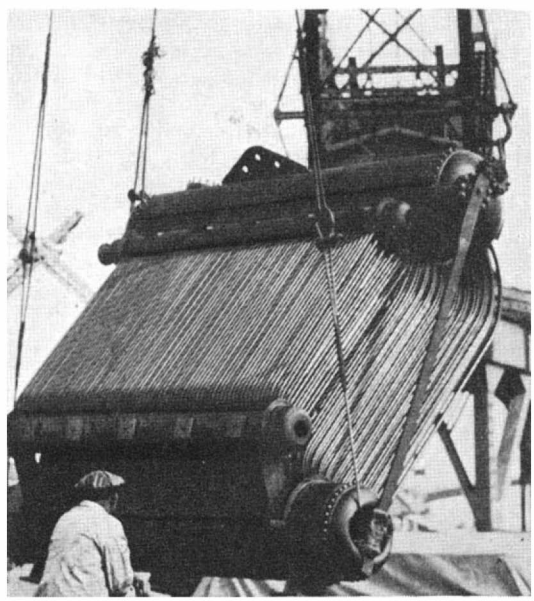
Among the major improvements of the *Mississippi* during modernization was the installation of the most up-to-the-minute anti-aircraft battery.

In the decade following the World War, little money was spent on new ordnance or guns because the great war-making states were over-stocked with surplus guns. In consequence, there was little or no improvement in the design of anti-aircraft guns or fire-control apparatus. On the other hand, commercial as well as military aviation were daily increasing the speed, maneuverability, ceiling, and useful loads of planes. That is, all the elements necessary to the battle efficiency of the planes were being continuously improved, while the gun marked time.

BY 1925, the airplane was well ahead of its natural, and in 1918 its most formidable, enemy, the anti-aircraft gun. Finally, the danger to some of our great cities unless American anti-aircraft guns could be improved, brought some small but gradually increasing appropriations to the Army and Navy ordnance designers. Almost at once the effectiveness of gunfire against planes increased. Since 1925 there has been a continuous increase in the efficiency of anti-aircraft batteries comparable to the increase in efficiency of planes. And it is a conservative statement to say that the danger from enemy aircraft has been greatly reduced. Naval aviators naturally believe in their weapon, but the naval crews of the anti-aircraft batteries are no less confident of their ability to keep enemy aviators where they can do the ship no great harm.

Uncle Sam has always taken splendid care of his navy personnel, so when he

(*Please turn to page* 331)



One of the six new boilers for the *Mississippi*, which are really extremely fast steam generators

OBJECTIVES IN AMATEUR PHOTOGRAPHY

THE accompanying article, second in our new series on advanced amateur photography, outlines specifically what discussions you may expect in coming months. A few of our subjects follow:

- **Panchromatic flower photography**
- **Scenic pictures, including filters**
- **Stellar photography**
- **Infra-red and ultra-violet photography**
- **Amateur aerial photography**
- **Pinhole photography (less simple than it sounds)**
- **Portraiture**
- **Night photography**

SEVERAL years ago an amateur photographer—a sailor aboard the ill-fated steamship *Vestris*—was very fortunate. He happened to have his camera ready when that ship was sinking, and the views he was able to snap on the careening deck brought him a large sum of money as news photographs appearing in newspapers all over the land.

But we know a photographer even more fortunate. One day, after several less successful efforts, he managed to get an excellent "close-up" of a woodpecker at work 150 yards away by photographing through one glass of his binoculars. He received no sum of money for his success, and only his cronies, instead of the whole nation, saw his result. Yet this enthusiast, depending on no element of luck, had attained the priceless satisfaction of setting himself an interesting objective and reaching it, of mastering a novel technique. A priceless satisfaction—yet one within the range of any seeker.

WHAT pictures shall the "advanced amateur" photographer take after he has gone through his snapshot apprenticeship and wishes now to take his pleasure in this hobby more seriously? What are objectives that will "pay out" in the form of the greatest satisfaction?

Moreover, what is there in photography for the followers of other hobbies? Let the astronomers and the stamp collectors and the gardeners and the firearms fanciers examine the camera's prospects to see whether pictures, taken with benefit of their special knowledge, might not provide the "clincher" in the thorough pursuit of any avocation.

Informal portraiture is not necessarily the exclusive preserve of snapshotters. Especially now that snapshots indoors are possible, portraiture of family and friends in "natural" poses and normal settings takes on new meaning.

Carry the urge for pictures of people one step further, and the amateur photographer will find himself going in for formal portraits. Effects given vogue by the Hollywood cameramen will serve as par, and simple lightings will do the trick when basic principles are comprehended.

Action pictures, sports "shots," add the fascinating element of speed. To catch a hurdler at the top of his jump, with every determined line of his face recorded in focus, or to establish the graceful dip of a landing airplane in perfect composition on a negative—these, in the achievement, seem to give permanent meaning to transitory phenomena.

Nature photography is ground for serious study in itself. Flower photography, with the newly available panchromatic roll film rendering true color values, is almost unexplored. Toads and tadpoles may become what someone has called "backyard monsters" to the knowing lens of an alert hunter.

Artistic tendencies can find full play in scenic photography or still-life arrangement. Training the eye to discover striking compositions that can be enlarged from small areas of whole negatives, and enlarging them—there's a large part of the fun. Beyond that are adventures in the treatment of enlargements by such interesting embellishing processes as the bromoil transfer.

The problems of photomicrography have challenged experts, yet an amateur photographer can link his simple camera to a microscope and obtain successful pictures of that mysterious world half a dozen inches away. (Note page 304 of this issue.)

Astronomy! When the telescope has been made, glimpses through it remain only in memory, unless a camera is attached to it. Making a camera telescope is, thus, the logical next step for amateur astronomers. Even without a telescope, a simple camera with an *f*/4.5 lens is adequate for meteor photographs or pictures of star tracks. Add a prism, and there is always the lurking chance of catching a meteor spectrum that would be prized.

Amateur meteorologists can find their opportunity in photography of clouds, sun dogs, rainbows; and what about a superstereoscopic view of a cloud bank, made with two cameras a mile apart, snapped simultaneously to yield perspective in an old-fashioned stereoscope? There's gold—golden opportunity—overhead.

While we're about it, there is nothing to prevent amateur photographers from exploring the invisible with their cameras. Photographic materials sensitive to unseen phenomena in the ultra-violet and infra-red ranges of the spectrum are now available. Pictures in the dark, haze-penetration views, detection of stamp forgeries by photography of invisible color aberrations—these are "in the cards" for the curious.

Who knows but that someone fresh from picnic picturing with a "Brownie" may end up snapping the air waves left by a passing bullet? It's possible, and he would not even lose his "amateur standing."

Night photography with a simple camera. Conditions: Wet streets, thin fog, *f*/11 diaphragm setting, seven minutes exposure on Verichrome film

NITROGEN FIXATION and the Future

By CHAPLIN TYLER
E. I. du Pont de Nemours and Company

THIRTY years ago, in 1903, the inorganic nitrogen production of the world was 349,000 metric tons, 63 percent of which was supplied by Chile. In 1933, despite sub-normal consumption generally, the inorganic nitrogen production of the world was nearly five times as much, or 1,700,000 metric tons, less than 10 percent of which was supplied by Chile. Furthermore, world capacity for the production of inorganic nitrogen has been built up to an estimated total of 3,383,000 metric tons, or about double the present rate of actual production and consumption.

In 1905 the Norwegians started the first commercially successful nitrogen manufacture; that is, fixation as nitric acid by the arc process. This process, now obsolete, did however attain a peak production of about 30,000 metric tons of nitrogen per year, despite the large power requirement of 60,000 to 70,000 kilowatt-hours per ton.

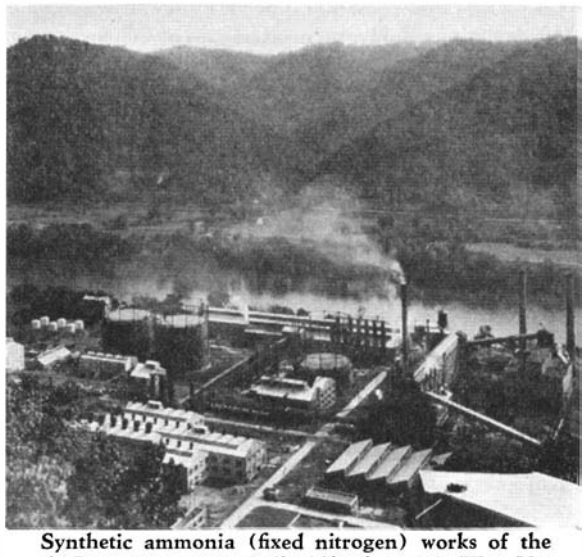
SOON afterward, in 1907-08, the cyanamid process was operated commercially and grew in importance until a capacity of 350,000 metric tons of nitrogen was attained. This process, while successful commercially for a long period, requires from 10,000 to 16,000 kilowatt-hours per ton of nitrogen, and the product is not entirely satisfactory as a fertilizer.

Not until 1913, when the Germans began nitrogen fixation by the Haber-Bosch ammonia synthesis, did there appear a real threat to Chilean supremacy. In the short space of 20 years, fixation by the ammonia synthesis has grown to the proportions of an industrial giant representing an investment of 600,000,000 dollars, involving 110 companies operating 123 plants in 19 countries.

The major economic consequences of this development have been: First, the destruction of the Chilean monopoly in nitrogen and the decline of the Chilean industry; second, the worldwide sufficiency of cheap nitrogen for agriculture; third, national independence of practically every important world power as to nitrogen supply for war munitions; and fourth, the application of the new high-pressure catalytic technique to the synthesis of methanol and the hydrogenation of numerous substances, especially of coal and oil, for the manufacture of synthetic motor fuel.

The former position of the Chilean nitrate industry is not easily appreciated without recourse to figures. Approximately 70,000,000 tons of nitrate (16 percent nitrogen) have been produced, which at 40 dollars per ton in Chile represents a total realization of 2,800,000,000 dollars. The former normal production of 2,500,000 metric tons of nitrate (16 percent nitrogen) per year represented an export trade of more than 100,000,000 dollars on which the national export tax was about 30,000,000 dollars per year, of which American consumers alone paid about 10,000,000 dollars per year.

To ship this quantity of nitrate required between 400 and 500 cargoes per year, assuming a lading of between 5000 and 6000 tons. The ocean freight on this movement was from 12 to 15,000,000 dollars per year. In the future, the volume of shipments is unlikely to exceed half of the former average of 2,500,000 metric tons, and the price in Chile may not exceed half of the 1926 price; therefore the realization of the industry, instead of being around 100,000,000 dollars per year, may not exceed 30,000,000 dollars.



Synthetic ammonia (fixed nitrogen) works of the du Pont company at Belle (Charlestown), West Va.

While tremendous effort has been made in the past five years to retain for Chile a continued commanding position in the nitrogen industry, it now appears that this effort was begun at least five years too late, that it was not too well conceived, and that finally, the potentialities of the synthetic ammonia development were grossly underestimated.

Year after year, nitrate to the value of 100,000,000 dollars was produced and yet the synthetic ammonia industry was well established before any vigorous action was taken regarding improved processes and drastically lowered prices. It has been estimated that the Chilean industry, which so easily could have set up ample reserves for development out of earnings, now is in debt to the extent of 275,000,000 dollars, a sum about ten times the present annual sales.

So complete has been the change in affairs that during the period 1932-33 the exports of synthetic nitrate of soda from the United States were about double the imports of Chilean nitrate. Norway also has a large balance of exportable synthetic nitrate of soda.

NORMALLY, the depletion of soils is a serious problem. The plant food in the soil is the most fundamental wealth of civilized peoples. Such crops as cotton, tobacco, and potatoes remove enormous quantities of "money" from the soil "bank account." Nitrogen, now derived largely from synthetic ammonia, is the most easily depleted plant food. Therefore it must be replaced, else agriculture eventually must be moved to virgin soil, of which there is none too much in the densely populated areas of the world.

The continual addition of nitrogen, together with other plant foods, enables the farmer to harvest a never-ending succession of crops from the same soil. Synthetic ammonia therefore is the chemist's insurance to the people that there never need be an insufficiency of not only cereal foods, but of protein foods as well, since milk, beef, and pork, for example, are produced from cereals and grasses.

Part of the nitrogen taken from the soil by crops is returned as natural manures, as nitric acid in rain water, and by the action of nitrogen-fixing bacteria. But this natural return of nitrogen is insufficient to maintain a correct balance in the soil, so that normally a supplemental quantity of from 300,000 to 400,000 tons of "artificial" nitrogen is used annually in this country in the form of commercial fertilizer. The total consumption for the world is about five times this quantity.

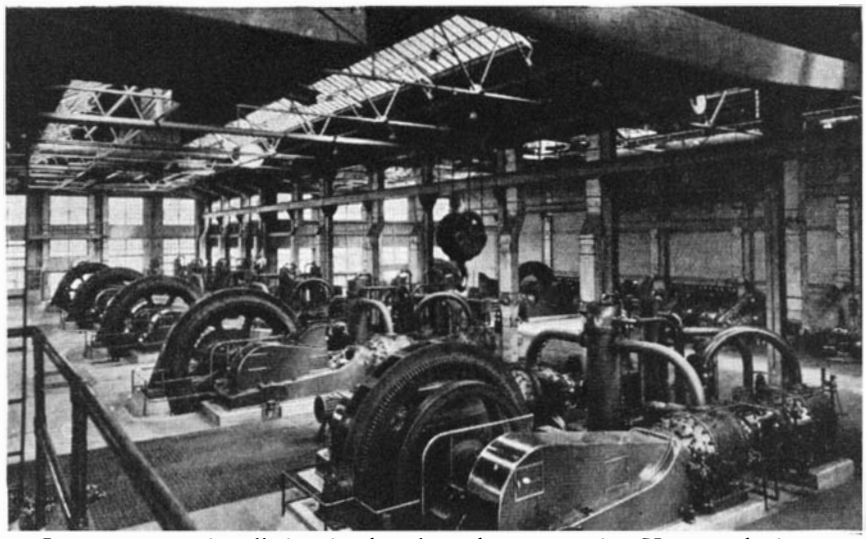
As stated previously, a large part of fertilizer nitrogen formerly came from Chile as the well-known "Chile saltpeter." While Chile saltpeter or nitrate of soda is an excellent fertilizer material, it was until the advent of the synthetic ammonia industry a comparatively expensive commodity. Whereas in the past nitrogen has been relatively expensive, today the cost of nitrogen actually is substantially as low as that of phosforus and not much more expensive than potash.

WITHOUT nitrogen, a major power hardly could start a war, much less sustain one. Ammonia, as such or converted to nitric acid, is an essential ingredient of modern military explosives. Similarly, without nitrogen, a power would be defenseless against outside aggression. Nitrogen ranks with steel, food, and clothing as a sinew of war.

The War Department has estimated that in the event of a major conflict the United States forces would require for munitions production 144,000 tons of nitrogen per year. This is equivalent to 900,000 tons of Chilean nitrate of soda, or 150 cargoes carried in the ordinary freighter of 6000 tons capacity.

During the World War, the fear of insufficient supplies of nitrogen was so great that the Congress appropriated 80,000,000 dollars of the taxpayers' money to build the much-publicized Muscle Shoals nitrogen plants, which incidentally could have turned out but a third of the nitrogen needed for munitions alone. Today it is of interest to note that the Belle, West Virginia, works of the du Pont company alone is sufficient to supply the entire requirements of the War Department in time of emergency.

Another large plant, that of the Allied Chemical and Dye Corporation at Hopewell, Virginia, produces synthetic nitrate of soda and ammonia, thus affording double security for nitrogen supply in case of need. The investment in these two plants, plus that of smaller producers of synthetic ammonia, is estimated to be between 80 and 90 million dollars, or about the same as for the Muscle Shoals plants. The capacity, however, is more than six times as great, assuming that Muscle Shoals could be operated at capacity.



Gas compressor installation in the plant shown opposite. Here synthesis gas is compressed to 15,000 pounds per square inch—one third as dense as water

The development of high-pressure technique by the synthetic ammonia industry has led to other operations of far-reaching significance. For example, about ten years after the first factory production of synthetic ammonia, Germany exported to this country synthetic methanol, made by the same general technique.

Today the wood distillation industry, which formerly produced about 7,000,000 gallons of methanol per year, produces only about 1,500,000 gallons per year, whereas about 8,000,000 gallons are being produced by high-pressure synthesis. The synthetic product is cheaper, more pure, and is practically limitless as to supply.

Another high-pressure synthesis, and one which may easily surpass the tonnage of ammonia itself, is that of coal and oil hydrogenation. Both England and Germany, which are large consumers of motor fuel and yet which have no petroleum resources, are developing the production of synthetic gasoline on a very large scale. This process is more than likely to prove profitable, and again serves to illustrate the rôle of chemistry in making nations more self-contained as to supplies of essential commodities.

Other applications of high-pressure technique are being evolved and will no doubt have added effect upon existing processes and upon the balance of international trade.

World consumption of inorganic nitrogen probably will continue to increase at a rate of 50,000 metric tons per year—that is, the rate of increase which has held for the 25-year period from 1908 to 1933. Only in eight out of these 25 years has the world production of nitrogen deviated more than five percent from this straight-line growth.

THIS slow, but seemingly sure, increased consumption of nitrogen indicates that the present enormous excess capacity theoretically will remain for many years. Actually, the production costs attained in plants built within the past five years are sufficiently low so that a large proportion of the Chilean industry and of the cyanamid industry, together with many of the smaller or older synthetic ammonia plants, can be considered to be uneconomic. The indications are that the rate of earnings on capital in the nitrogen industry will be low; that is, nearer five percent than ten percent.

While agriculture theoretically should consume enormous quantities of nitrogen, the fact remains that the rich soils of our plains will sustain a nominal rate of production of grains for years to come without the aid of commercial fertilizer. Only on intensively cultivated areas is fertilizer a necessity, and the larger proportion of the 400,000,000 acres of crop lands is not so cultivated.

Therefore, while the outlook with respect to nitrogen fertilizer consumption is not unattractive, the time when an enormous quantity must be used is perhaps 100 years hence, rather than ten years hence. Beyond that era, should the area of cultivated land begin to be inadequate, it is perhaps comforting to know that protein foods, palatable and highly nutritious, can be made easily and reasonably cheaply from yeast plants fed in turn with nitrogen from synthetic ammonia.

THE AMATEUR AND HIS MICROSCOPE—XI

PHOTOGRAPHING SPECIMENS

By JOHN V. BUTTERFIELD
and
JOHN F. BRANDT
Bausch & Lomb Optical Company

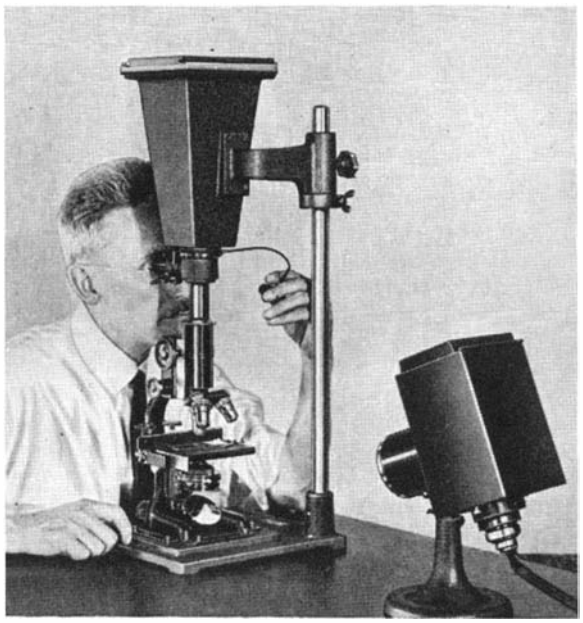
THE great explorer fights his way through strange lands, taking pictures as he goes. Back home again he goes on a lecture tour, showing his pictures on the screen—strange people, ferocious beasts, weird sights that thrill his audience and for the moment take them with him through all his adventures. But no explorer who ever roamed can show you more fascinating pictures than you can take through your own microscope—pictures of specimens gathered within a stone's throw of your front door.

Photomicrography, like many other things, can be simple or complex. An expert photomicrographer will sometimes spend hours arranging the illumination of a single specimen. His apparatus is large and apparently filled with all sorts of gadgets until it looks like one of Rube Goldberg's famous inventions. His subjects are as difficult as his technique. But the specimens in which most of us are mainly interested can be photographed with a minimum of equipment and just enough difficulty to make it a lot of fun.

A photomicrographic set-up consists simply of a light source, a microscope, and a camera. The light source need be nothing more than an ordinary frosted Mazda bulb. A 50-watt size or larger will do. Any good microscope will suffice, provided it is equipped at least with a concave mirror or, better still, a substage condenser and plane mirror. Any camera may be used, folding or box. Its lens is not necessary. In fact a lens, unless it is particularly good, will detract from the quality of your pictures.

If the lens cannot be removed, focus the camera at the "infinity" or 100-foot mark. In other words, a light-tight box, with some form of film holder at one end and a hole for the microscope eyepiece at the other end, is all that is really necessary. A ground glass, or some other means of focusing in the same plane as the film, should be arranged.

The illumination necessary to produce good photomicrographs is much more critical than that which is generally used for visual work. In the first place, the illumination must be brighter, and it must be carefully focused on the specimen. The photographic emulsion is capable of showing variations and errors in illumination much more readily than the eye and improper illumination may lead to erroneous interpretation of details in the specimen.



A simple type of professional photomicrographic equipment. The observation eyepiece permits the user to see the specimen till it is photographed

A "good" microscope was mentioned above, since there is no more extreme test of the quality of an instrument than making photomicrographs. In this work the resolution becomes all-important, and the lack of flatness of field which might be overlooked by the eye is only further emphasized by the photographic negative. I do not mean to say that only an expensive microscope will give you these qualities to an adequate degree, but price is invariably the measure of the quality of a microscope. The microscope should be fitted with either a concave mirror or a substage condenser of the correct focal length, and a plane mirror to bring the light to a focus on the specimen. The microscope may be used in either a vertical or horizontal position.

The only further requirement for the camera, other than that already mentioned, is that it be mounted rigidly in line with the microscope optical system and that the negative be exactly parallel with the specimen. A light-tight connection between the camera and the microscope eyepiece may be arranged in several ways. One of the simplest is to wrap a piece of black cloth, such as velvet, around the top of the microscope eyepiece and press it against the camera around the opening. A shutter is convenient, but not an absolute necessity. The exposure time may be controlled by simply switching on and off the illuminating source for the required amount of time.

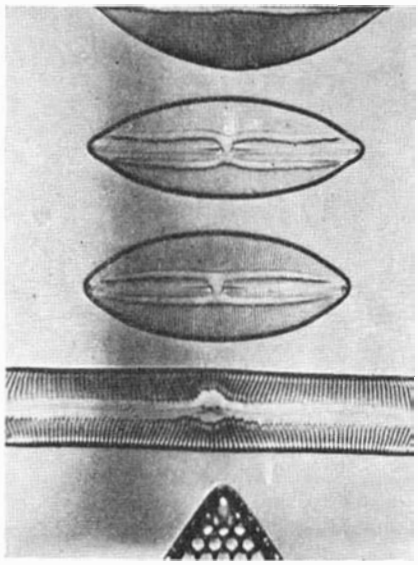
THE complete photomicrographic set-up should in some way be protected from vibration. Several pieces of felt may be used, or a sponge rubber kneeling pad may be bought at the ten-cent store and placed under the whole arrangement when it is mounted on a wooden or metal frame. Of course, complete photomicrographic outfits can be bought. You may be satisfied with the arrangement as suggested above, or it may serve merely to give you an idea of how fascinating this part of your hobby can be before you purchase the regular equipment.

The amateur is not generally acquainted with the theories of image formation and resolution. It is not necessary to know all of this in order to obtain good photographic reproduction, but it is necessary, however, to know the conditions which must be set up in the system, which will fulfill the requirements of the theories. Most important of all is the proper illumination of the specimen. Making clear pictures with sharp detail is entirely dependent on illumination.

For maximum resolution of detail in specimens, and an even brightness over the entire field of view, the following

conditions must be met: (1) When the specimen slide is on the stage of the microscope the specimen should be at the apex of the cone of light focused by the concave mirror or the substage condenser. (2) The cone of light from the mirror or substage condenser must form an image of the source of light in the plane of the specimen. (3) Observation of the beam of light emerging from the eyepiece at the point called the "exit pupil," Ramsden disk or eyepoint, or the back lens of the objective as seen through a pinhole placed over the eyepiece tube of the microscope when the eyepiece has been removed, must show a full, evenly illuminated disk of light. (4) From condition 2 it follows that the source of light must be of such a size that the image, which is formed by the substage condenser or mirror, will be large enough to cover the area of the specimen which is being projected through the microscope.

Of course, the light source may be clear sky seen through a clear window. The microscope should be set close enough to the window, or in such a position that the window bars will not be imaged on the specimen by the mirror or substage condenser. If such a position is not convenient, a piece of ground glass about three or four inches square should be set up in front of the mirror, so that the light from the window will be diffused and thus eliminate the image of the window bars. In case a clear glass incandescent bulb is used for a light source, a ground glass or other diffusing medium should be set up between the light and the microscope. Otherwise the filament of the bulb will be focused on the specimen and be seen on the photographic plate. The ground glass is then considered as the source of light.

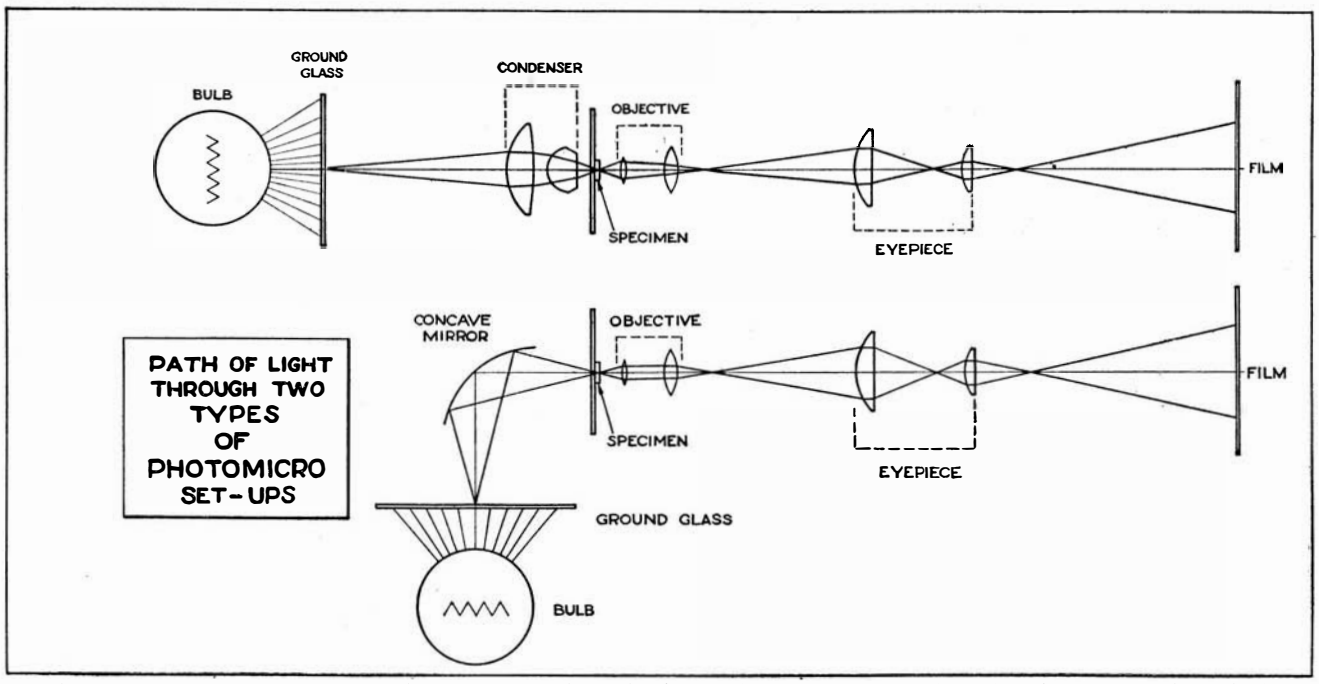


Diatoms, 375 X (reduced about one third in reproduction). Illuminant not properly centered and focused, causing unevenly illuminated field

To adjust the illumination when sky light is not used, look into the microscope eyepiece and tilt the substage mirror until the maximum light comes into the field. Now focus the objective on the specimen on the stage. If the stage or substage condenser of the microscope is fitted with an iris diaphragm, leave this open. Place the point of your pencil against the ground glass at the center and, if there is a condenser, adjust it until the pencil point is in the best focus. If there is no condenser, move the ground glass toward or away from the microscope until you secure the same effect.

Remove the eyepiece of the microscope and observe the back lens of the microscope objective by looking through a pinhole diaphragm placed over the opening in the tube from which the eyepiece is taken. This pinhole diaphragm is made by simply punching a pin through a small piece of heavy paper or card, which is held over the center of the tube opening. When viewed in this manner, the back lens of the microscope objective should appear as a full disk, evenly filled with light. If such is not the case, readjust the position of the light source and the inclination of the mirror. If the microscope is one of the miniature types, the eyepiece may not be removable. In this case, a magnifier may be used to examine the image of the back of the objective (Ramsden disk) which is formed just outside the eyepiece where the eye is held for visual observation.

Now we can test and see whether we have done all of these things properly. If the illumination is properly adjusted and centered, the image seen in the microscope should remain stationary as we focus up and down. The points in the structure will appear to expand or contract as they go in and out of focus. When the illumination is off center, and the light is passing obliquely through the specimen into the objective, the image will have the appearance of "creeping" off to one side as we change focus. When the best focus is obtained, decentered illumination has a tendency to distort the actual appearance of the specimen and often leads to false impressions. This does not mean that oblique illumination cannot be used. Some specimens, especially



The two diagrams are identical in the portions at the right, but in the upper diagram the light, after passing through the ground glass, goes through a sub-stage condenser. In the lower diagram a concave mirror is substituted for the condenser

very tiny structures such as bacteria, are best seen with the light reflecting off their sides. However, exactly centered illumination is most generally used, and the amateur will soon determine for himself when it would be best to change this procedure.

Cheaper microscopes are not well corrected for color. Monochromatic light will offset this, and may be used to advantage in both visual and photographic work. Green is the best color to use. Obtain a green photographic filter, about four inches square, from any photo supply dealer. Lean this against the stage between the light and the mirror.

Now we are ready to snap the picture. Place the camera in position, with a light-tight connection between the eyepiece tube and the camera. Observe the image as it is projected on the ground glass of the camera; some slight focusing of the microscope will be necessary. Adjust the specimen so that the image is projected exactly in the center of the ground glass. To make the centering more convenient, it is well to rule cross lines with India ink on the ground glass, accurately placed so that the point of their crossing will be the exact center of the film.

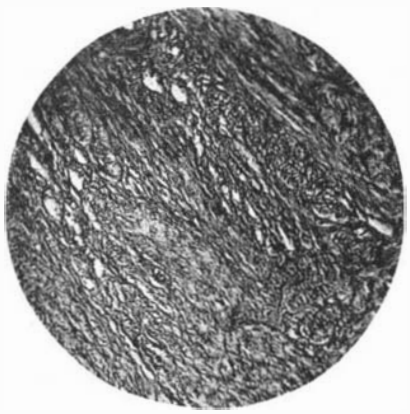
THE shutter is now closed or, if the camera has no shutter, the illuminating source is turned or blocked off. Replace the ground glass with the film. Click the shutter or switch the light on and off, and there you have your first photomicrograph.

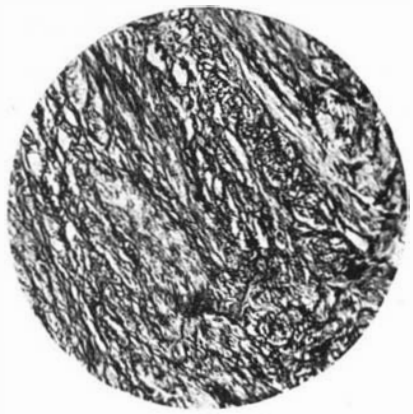
"Click the shutter" makes this part of your work sound simpler than it really is. Exposure time is just as important in photography with the microscope as it is in other kinds of photography. Many factors enter into the determination of the exposure time: the power of the light source, the amount of magnification, speed of the plate, the opacity of the specimen, and whether or not color filters are being used. All of these factors may make the exposure time extend from a "snapshot" of one fiftieth of a second to several hours. There are some highly complicated ways of figuring out the exposure time more or less precisely, but most amateurs and professionals simply use the trial and error method. As they make each exposure they note down all the conditions connected with it, and soon come to learn about what is best. (You will find that a photomicrograph of a fly's wing, using the 60-watt frosted bulb and roll film, such as Verichrome, will take about one second exposure.)

Because the exposure time is so uncertain it is advisable for the amateur photomicrographer to develop his own negatives and, perhaps, make his own prints. It is quite simple to do this in your own kitchen. You will have better results, save time and money and, above all, add to the fun of the thing. It all seems much more worth while if you can see the results of your work 10 or 15 minutes after making the exposure than if you have to wait while your photographic supply store does the job for you.

The whole outfit—"Beginner's Developing Outfits" as they are called—may be bought from your photographic dealer. But if you want to assemble it yourself, the following are necessary: A six-cent tube of MQ Developer, or its equivalent, which will develop two or three rolls of film; a half pound of acid fixer, which costs about 25 cents and makes up about two quarts of acid fixing bath and can be used for many negatives and prints; three photo developing trays, two just a little larger than the size of the film you use and one about 8 x 10 inches, for washing your prints; a safe light; graduate, stirring rod and thermometer; and some arrangement for making the prints. The directions for use are stated on each bottle of the developer. You will notice that the manufacturer has given the best developing time at a certain temperature. It is better to keep to this time.

Section of fibroid tumor, X 130. *Right:* Good resolution and proper appearance, due to critical illumination, proper centration, use of maximum aperture of objective. *Below:* Same, showing effect of closing sub-stage iris too far. Note blocking of detail, shrunken appearance of structure and a sort of shriveling at the edge of the field

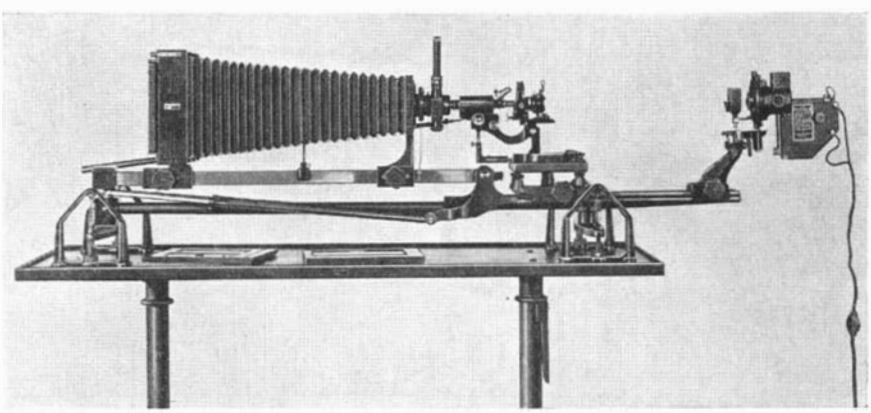




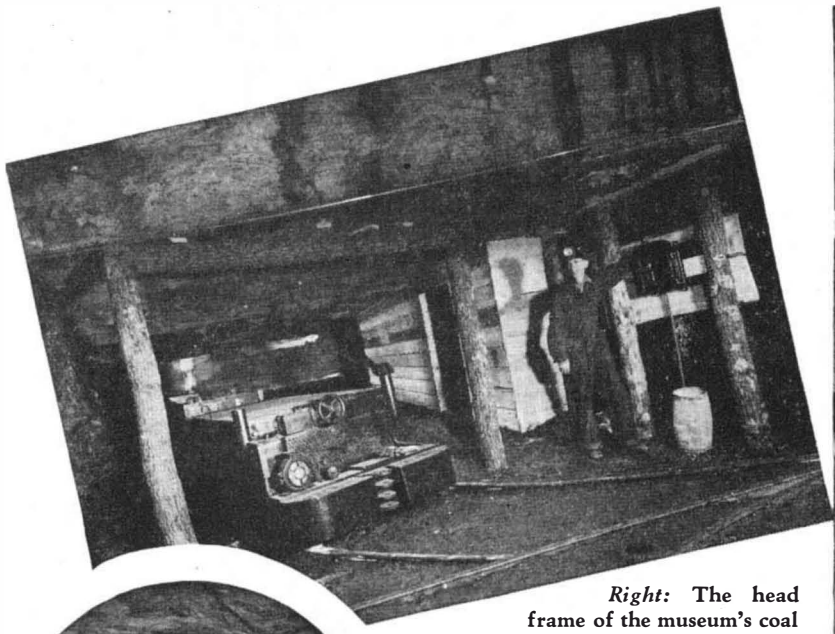
YOUR photographic dealer will be glad to give you any information you may need with regard to developing and printing films. Try making a photomicrograph just once and you will enjoy it so much that you will soon fall into the habit of feeling that you have not properly viewed a good specimen until you have seen your own photomicrograph of it. Start an album right away—and some day it will be one of your proudest possessions.

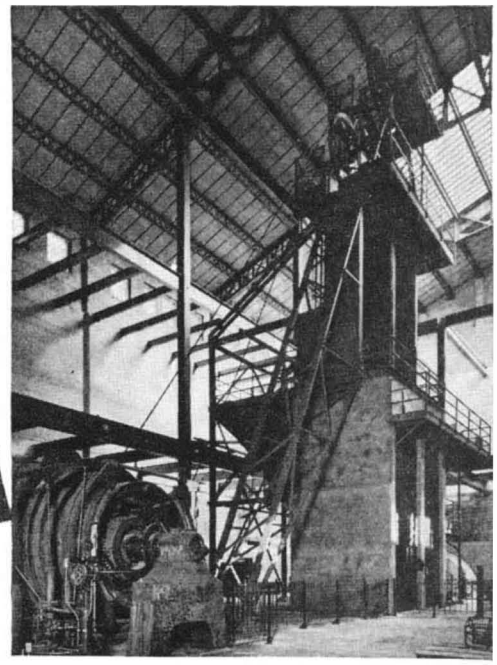
One more thing: It is very definitely "photomicrograph" and not "microphotograph." There are such things as microphotographs—curiosities that you may run across from time to time in some old collection of slides. They are photographs made on microscope slides and are so tiny that, to the unaided eye, they look like nothing much more than the period at the end of this sentence. Viewed under the microscope at fairly low magnification, they are exquisite miniatures of fine paintings or other subjects.

EDITOR'S NOTE: *The Editor would be interested in seeing your photomicrographs. Send them along and, if you are agreeable, we may be able to publish some of them from time to time.*



Photomicrographic equipment of about the most complex type available. It gives photomicrographs up to 12,000 X. Mounted on anti-vibration springs

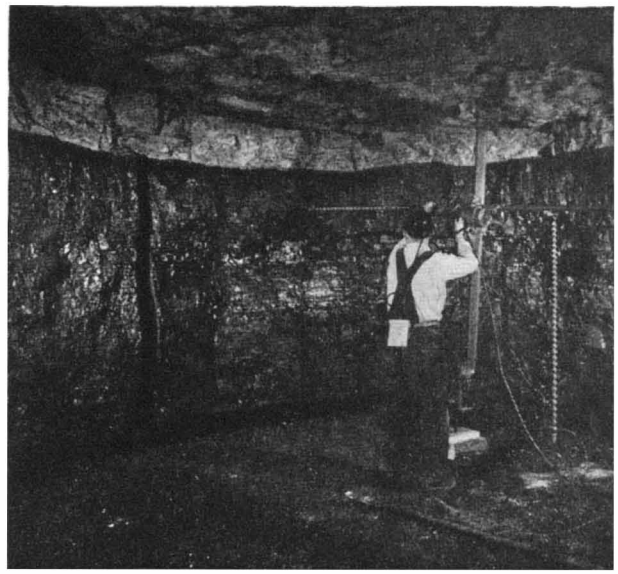




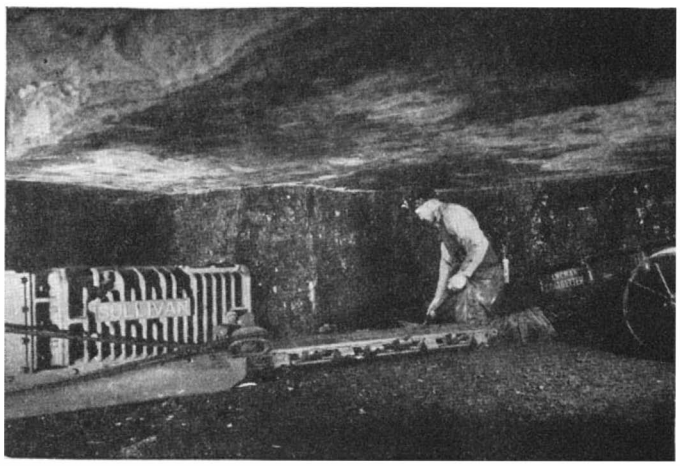
Right: The head frame of the museum's coal mine stands 65 feet in height

Above: An entry to the main haulage-way of the mine. A low electric mine locomotive is at the left

Circle: A miner, working with regular equipment, demonstrates how an undercut and shear are made



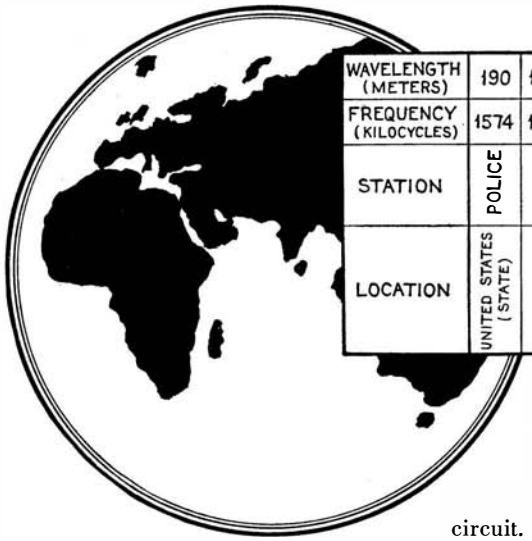
Above: A post drill boring holes into which explosives are to be inserted for bringing down large quantities of coal



Left: Working on a low seam in the mine. Notice in particular the special equipment that is employed for this work

Full-Size Coal Mine in a Museum

IN the rehabilitated Fine Arts Building, in Jackson Park, Chicago, which has now been practically rebuilt in permanent form, is an operating bituminous coal mine which constitutes the major exhibit in the Museum of Science and Industry, recently opened to the public. Much effort has been expended in this unique reproduction of a full-size coal mine, so that both the mechanical and geological details will be provided. On entering the Museum the most prominent feature is a huge mine hoist holding 500 feet of cable. The head frame rises 65 feet above the main floor. At three minute intervals the cage arrives to take 30 people into the mine itself and the skip dumps seven tons of coal, which has been raised from the shaft bottom. The visitors apparently descend for 500 feet. As the cage approaches the center of the shaft, the smell of the coal mine greets the nostrils. Arrived at the bottom of the shaft the group sees a rotary dump taking full-size loaded mine cars and turning them upside down. The visitors are shown various features of coal mining, are given a ride in a regulation mine train, and are taken to see the coal actually being mined. An artificial fire-proof coal has been provided which defies detection and a perfumer has produced a synthetic liquid which provides the odor of the mine. The artificial coal is prepared in a plastic state and is pressed against the walls of selected mines in order to obtain authentic surface markings and present fossil and geological formations for study at first hand.



WAVELENGTH (METERS)	190	175	167-150	124-120	77-75	70.2	50.21	50.0	49.83	49.59	49.5	49.26	49.26	49.10	49.02	42.86-41.1	38.48	32.26	31.55	3
FREQUENCY (KILOCYCLES)	1574	1712	1800-2000	2412-2506	3900-4000	4273	5968	6000	6020	6050	6060	6090	6090	6110	6120	7000-7300	7797	9300	9510	9
STATION	POLICE	POLICE	AMATEUR	POLICE	AMATEUR	RW 15	HVJ	RV49	DJC	GSA	VQ7LO	CP5	OXY	YV1BC	ZTJ	AMATEUR	HBP	CNR	GSB	
LOCATION	UNITED STATES (STATE)	UNITED STATES	PHONE	UNITED STATES	PHONE	KHABAROVSK, U.S.S.R.	VATICAN CITY	MOSCOW, U.S.S.R.	BERLIN, GERMANY	LONDON ENGLAND	NAIROBI, KENYA, AFRICA	LA PAZ, BOLIVIA	COPENHAGEN, DENMARK	CARACAS, VENEZUELA	JOHANNESBURG, AFRICA	MOSTLY CODE	GENEVA, SWITZERLAND	RABAT, MOROCCO, AFRICA	LONDON, ENGLAND	

When listening in for foreign short-wave stations, the important ones of which are listed his location and that of the desired station. The transmission frequencies of the *Jacob*

Around the SHORT-WA

By LOUIS
Technica
Short Wave R

RECENT improvements in the construction of radio receivers have opened a new avenue of entertainment to the listener-in. Not many years ago, one of the big thrills of radio was to listen to a station a few hundred or even a thousand or more miles away. Then regular broadcasting settled down to a basis of providing consistent entertainment and the thrills of DX gradually subsided. Now, however, there is an opportunity to recapture the glamor of distance radio reception and on a much grander scale than ever before. The whole world is at the fingertips of the owner of a properly designed short-wave receiver: London, Berlin, Paris, Moscow, Tokyo, Melbourne, Little America—all at the twist of a dial.

This tremendous increase in the scope of radio reception for the general public has been made possible by numerous improvements in radio circuits, an increase in the sensitivity and utility of vacuum tubes, and, most important of all, the development of manufacturing and adjustment processes of an accuracy heretofore unnecessary in the construction of standard broadcast receivers.

The sets which make possible long-distance reception on short waves are generally known as all-wave receivers. Actually, the majority of these receivers cover only those wavelengths from approximately 15 to 550 meters. This, however, is all that is necessary for the average person, as those wavelengths above 550 meters are mainly devoted to commercial traffic in code and therefore hold little entertainment value.

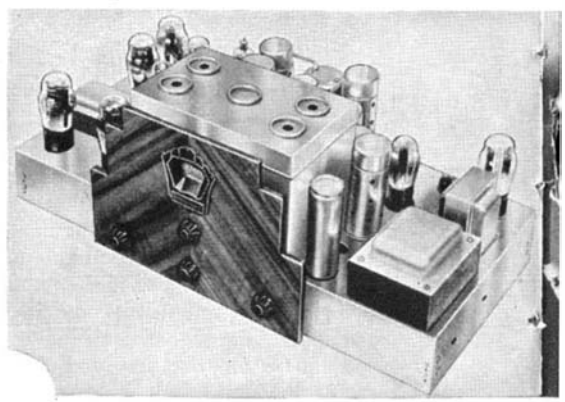
The design of a satisfactory all-wave receiver is an engineering problem of no mean proportions. To cover a wide band of wavelengths it is necessary to provide a series of separate tuning circuits, in order to avoid unbalancing and other undesirable factors which necessarily are introduced when a wide tuning range is obtained with a single circuit. In the all-wave receivers, the separate coils and condensers are progressively connected in the circuit by means of a selector switch which determines the wavelength band that can be covered by the dial. In one type of receiver, for example, the first position of the selector switch enables the tuning dial to cover the complete broadcast band. In the second position the range covered is from 75 to 200 meters, and so on down to 15 meters. On the face of the dial are several different scales, one for each wavelength range. This combination of mechanical parts and electrical circuits provides simplicity of operation and convenience and rapidity of switching from one range to another.

IT may be difficult for the layman to understand how it is possible to pick up broadcast stations from foreign lands with comparative ease when he may find it impossible to receive Los Angeles from the east coast on his broadcast receiver. The answer lies in the fact that radio waves below the broadcast band carry better than do the longer wavelengths. It is interesting to note this apparent anomaly: The sensitivity of most all-wave receivers is greater when the selector switch is in the broadcast position; the sensitivity becomes less and less as the receiver is tuned to a lower wavelength. However, due to the characteristics of short waves, far greater distance reception is possible in these bands, even with the decreased sensitivity of the receiver.

There are other peculiar things about reception on the shorter wavelengths. For example, there is the so-called "skip distance." On wavelengths around 50 meters, reception is most reliable at a distance of perhaps 300 miles or more from the transmitter. Within a radius of 75 miles of the transmitter, reception may also be fairly good, but between 75 and 300 miles reception is often impossible or at best is unreliable. This skip distance, with variations in the actual figures, is to be found on all of the shorter wavelengths and will

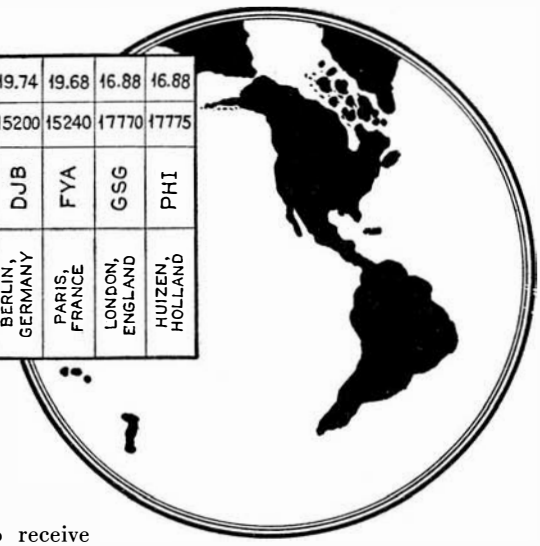
A circular tuning dial with four different scales is a feature of this particular all-wave receiver

An all-wave rec Admiral Richard the *Jacob Rupp* now in the encar



The chassis of two types of all-wave receivers are sl cuits assure ample sensitivity and selectivity for 'r undesirable noises. Accurately balanced tuning cir for the operator to change rapidly from any one of

1.5	31.51	31.38	31.30	31.28	31.26	31.25	30.43	25.64	25.53	25.51	25.4	25.29	25.21	23.38	21.2-21.1	19.84	19.82	19.74	19.68	16.88	16.88
510	9520	9560	9585	9590	9595	9600	9855	11700	11750	11760	11810	11865	11900	12830	14150-14250	15120	15140	15200	15240	17770	17775
VK3ME	OXY	DJA	GSC	VK2ME	HBL	XETE	EAQ	FYA	GSD	DJD	I2RO	GSE	FYA	CNR	AMATEUR	HVJ	GSF	DJB	FYA	GSG	PHI
MELBOURNE, AUSTRALIA	COPENHAGEN, DENMARK	BERLIN, GERMANY	LONDON, ENGLAND	SYDNEY, AUSTRALIA	GENEVA, SWITZERLAND	MEXICO CITY, MEXICO	MADRID, SPAIN	PARIS, FRANCE	LONDON, ENGLAND	BERLIN, GERMANY	ROME, ITALY	LONDON, ENGLAND	PARIS, FRANCE	RABAT, MOROCCO, AFRICA	PHONE	VATICAN CITY	LONDON, ENGLAND	BERLIN, GERMANY	PARIS, FRANCE	LONDON, ENGLAND	HUIZEN, HOLLAND

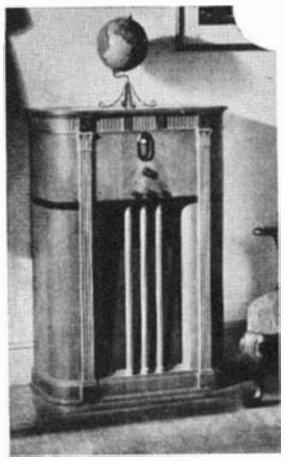


in the above chart, the listener should always keep in mind the difference in time between *Ruppert* of the Byrd Expedition, not listed here, range from 6650 to 21,265 kilocycles

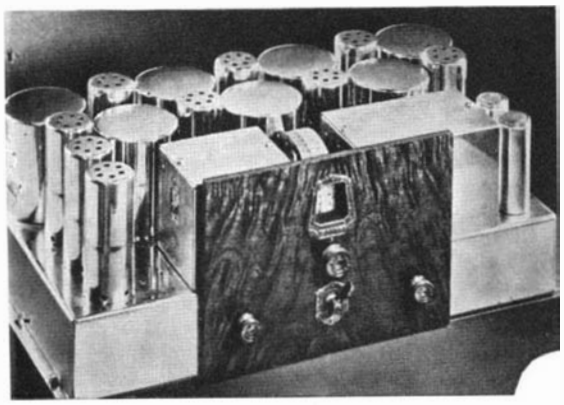
World with VE RADIO

MARTIN
Director
adio Magazine

iver being operated by E. Byrd in the cabin of rt. This same receiver is pment at Little America



A globe is a valuable adjunct to the operation of an all-wave radio receiver



wn in the two lower photographs. Multiple tube circ- nd the world reception, and careful shielding reduces its, connected to selector switches, make it possible he wave-bands to another with a minimum of trouble

often account for inability to receive domestic stations while at the same time foreign reception is excellent.

This so-called skip distance is caused by the action of the Heaviside layer which, because of its varying height above the surface of the earth, is also responsible for the phenomenon known as fading. In modern all-wave receivers, however, actual fading—when the signal does not disappear entirely—is taken care of by automatic volume control. When the signal is strong the sensitivity of the receiver is automatically reduced; when the signal starts to fade the sensitivity automatically increases by an amount necessary to make up for the difference, with the result that the volume from the loudspeaker remains practically constant.

THE operation of an all-wave receiver, when the band selector is set for one of the shorter wavelengths, is somewhat different from that of the ordinary broadcast set. Because of the wide range of frequencies covered by the tuning dial on the short waves, the tuning is extremely critical or sharp. Even a station that comes in with ample volume will often be passed over without a sound if the tuning dial is not rotated very slowly. The amount of care which must be exercised in tuning on the short waves is indicated by the following quotation from the instruction sheet furnished with one of the best all-wave receivers now available: "Advance the volume control to a position near the middle of its range and rotate the station selector until the dial indicator assumes a position coincident with the listed frequency of the desired station. . . . Then turn the selector *very slowly* over a narrow range on each side of that setting, advancing the volume control further in a clockwise direction and repeating the tuning process if necessary until the signal is heard."

Aerials for use with short-wave receivers should be very carefully installed. Particularly must they be well insulated from all objects and must not run close to, nor parallel with, electric circuits either inside or outside the building. Static on short waves usually gives little trouble, but so-called "man-made" interference, such as street railway lines, automobiles in motion, oil burner installations, and so on, often create undesirable noises. This trouble can be minimized by erecting the aerial as far as possible from such sources of interference. Generally speaking, the aerial should have a length of from 25 to 75 feet, including the lead-in and ground wire. In some locations shielded aerials may be necessary for best results. Indoor aerials will sometimes be found satisfactory in buildings of non-metallic construction.

Because of the facts which have been determined about short-wave transmission and reception within the last year or so, and also because of refinements in manufacturing, radio set makers are now in a position to guarantee foreign reception. The consistency of this reception cannot be guaranteed, however, but under ordinary conditions and in a good location, a well-made all-wave receiver will prove to be a source of much enjoyment and unusual entertainment. When foreign stations do not come through with all of the volume and quality desired, it is always possible to turn to the aircraft and police bands. Here there is no entertainment as such, but there is adventure—the thrill of listening, in your easy chair by the radio, to the stern realities of police and aerial transport work as exemplified by their routine but exciting radio communications.

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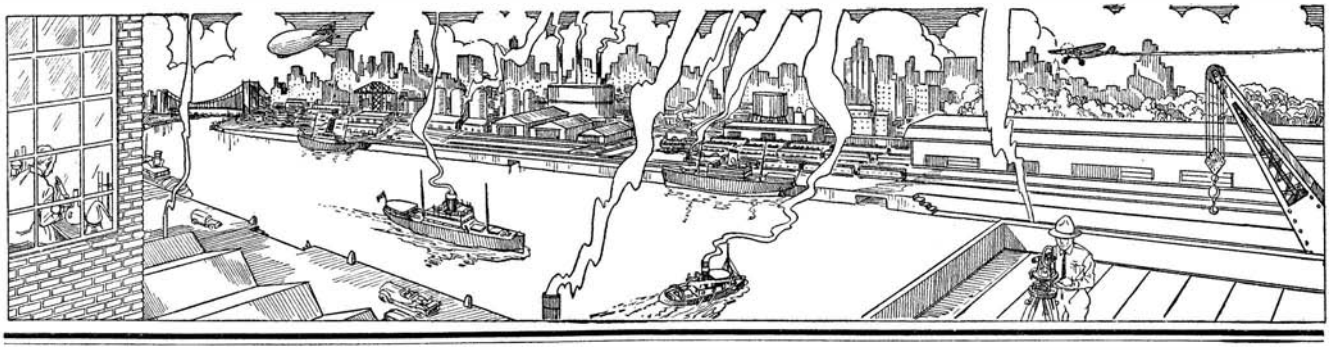
Due to unforeseen circumstances, the article "Scientific Angles of Angling," scheduled for this issue and announced on page 226 of May, had to be held over and will appear next month. We can assure you that it will be worth waiting for.—The Editor.



THE SCIENTIFIC AMERICAN DIGEST

Conducted by F. D. McHUGH

Contributing Editors

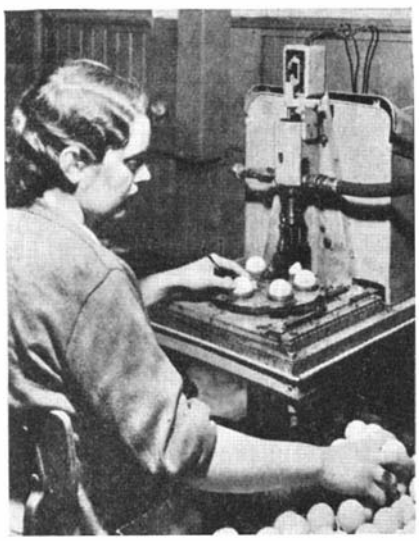
ALEXANDER KLEMIN
In charge, Daniel Guggenheim School of Aeronautics, New York University

A. E. BUCHANAN, Jr.
Lehigh University

Golf Ball with "Shot in the Arm"

ONE of the main essentials of a long distance golf ball is high pressure at the core, which provides the necessary high elasticity under impact of the club head. This pressure, exerted on the liquid sac which constitutes the core, is built up by the winding over the core of a continuous thread of rubber under tension.

The cover is then applied over the winding by a moulding process which seals the two halves. In the case of long distance, softer cover balls, the moulding temperatures are not high enough to cause loss of tension on the winding, and in consequence an internal pressure of 1500 to 1600 pounds per square inch is retained in the finished ball.

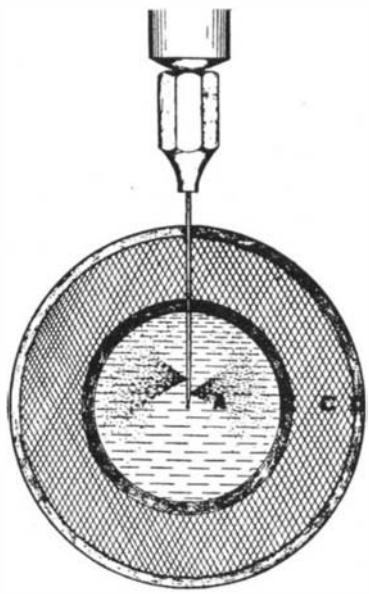


An operator treating golf balls to increase internal liquid pressure

When the tough cover of cut resisting balls is applied, however, much higher temperatures are required. The result is a loss of a part of the tension on the rubber winding, the effect of heat on stretched rubber, and a consequent loss of a part of internal pressure. The result is a ball which, while having a cover that is practically proof against cuts, at the same time has a distance from 7 to 10 yards less than its softer covered brother.

Here was the problem—how to restore the lost pressure and still retain the tough cover. Obviously it was a job that had to be done after the ball had been completed, since the loss of pressure was an inescapable result of the vulcanizing process. The problem was solved as follows:

A hollow steel needle, similar to a fine hypodermic needle, is thrust through the cover, through the rubber thread windings, and into the liquid center. An added quantity of liquid—exactly six one-hundredths of an ounce—is forced in under high pressure. Immediately an initial pressure of 800 pounds is raised to about 1400 pounds, being what the ball really needs to get maximum distance.



How the ball gets its "shot"

Freshness of Fish Indicated by Voltage

BY measuring the "voltage" of a fish, its relative freshness may be determined, says *Food Industries*. Around this discovery, Maurice E. Stansby and James M. Lemon, scientists at the Gloucester, Massachusetts, station of the Bureau of Fisheries, have worked out a method for finding out how long non-fatty fish, such as haddock, may be expected to keep.

The test is conducted in two steps: The first is to neutralize the basic decomposition products in the flesh with acid; the more acid required for immediate neutralization the greater the decomposition. The second step is to determine the amount of protein breakdown present. This is done by adding more acid after neutralization of basic decomposition products and observing the ability of the flesh to combine with it. Flesh from a fresh fish combines with more acid than that from one in which considerable protein breakdown has occurred.

To determine the acidity of the fish, the flesh is chopped and mixed with water. Quinhydrone is then added and a platinum electrode is dipped into the mixture. The electromotive force produced by this half cell, as measured against a reference electrode, is proportional to the acidity.—*A. E. B.*

Electric Erasing Machine Held Like a Pencil

A NEW electric erasing machine, light, compact, and durable, is announced by Charles Bruning Company, Inc. The new machine is designed to be held in the fingers like a pencil, rather than in the fist, and thus to enable the operator to maintain

A small electric motor drives the draughtsman's high-speed eraser

accurate finger control when erasing pen or pencil lines from tracings or drawings. The machine is operated by a self-contained electric motor operating on 110 volts.

Dr. Clement Cleveland

DR. Clement Cleveland, surgeon director emeritus of Woman's Hospital and consultant surgeon for 52 years on the staff of the Memorial Hospital, New York City, of which he was a founder, died April 16, 1934.

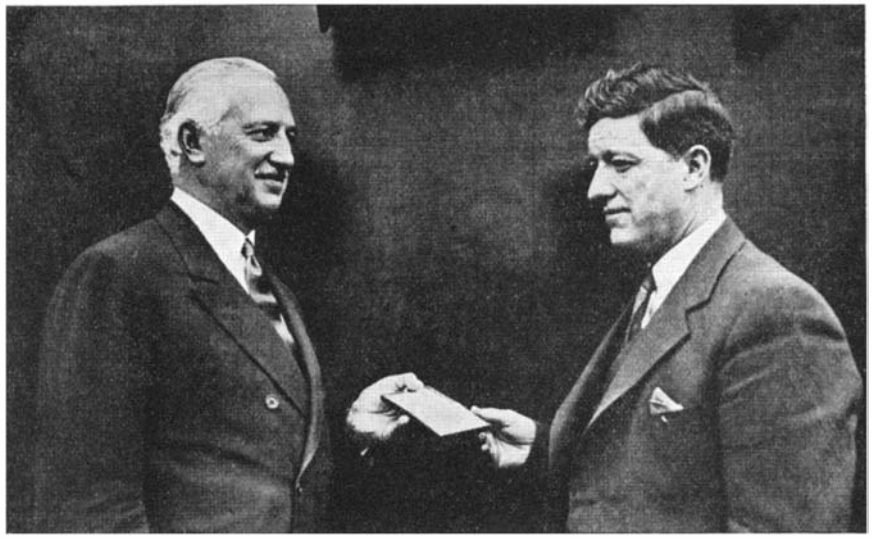
Dr. Cleveland, a second cousin of President Grover Cleveland, specialized in gynecology and was one of the leaders in his field a generation ago. He was the inventor of many surgical instruments and appliances, the most noted of which was known as the Cleveland Operating Table. He also devised a ligature carrier which had wide use, and modified the speculum for gynecological work. Dr. Cleveland was born in Baltimore in 1843.

Cedarized Containers Don't Stop Moths

THE mere odor of cedar does not protect clothing from moth attack. Cedarized cardboard closets and cardboard boxes offered the public for protecting winter clothing and blankets against clothes-moth damage will not in themselves safeguard the articles stored in them. During the past summer and fall entomologists of the United States Department of Agriculture made tests of closets and chests impregnated with cedar oil or cedar chips, and the results indicated that many of these containers are worthless when used in accordance with the instructions issued with their sale.

The experiments also proved that moths have no difficulty in crawling into most kinds of cardboard containers, unless all cracks, holes, and gaps are sealed with adhesive tape or heavy gummed paper, or unless the box is wrapped in an outer covering of strong unbroken wrapping paper so folded under at the ends that no moths can get in. Otherwise, once inside, the females lay many eggs and the eggs hatch into worms, which are not killed by the cedar odor, but continue to grow and cause much damage by feeding on the materials stored.

The specialists of the Department do not believe that such cardboard closets and boxes can be depended on for moth protection unless the articles stored in them are sprinkled plentifully with flake naphthalene or paradichlorobenzene crystals and the cracks about the doors of the closets and lids of the boxes carefully sealed with adhesive tape.



Orson D. Munn, Editor of *Scientific American*, presenting the Arthur Williams Medal to Captain Flavel M. Williams, in recognition of the work which he has done in developing the fog navigating camera which increases safety at sea. Medal shown at left

Medal Awarded for Fog Navigating Camera

THE Arthur Williams Medal, awarded through the American Museum of Safety, was recently presented to Captain Flavel M. Williams for the invention of the infrared navigating camera which was described on page 120 of the March 1934 issue of SCIENTIFIC AMERICAN. The award was made at a luncheon on the S. S. *Manhattan*, the same ship on which the fog navigating camera has undergone a series of extensive tests.

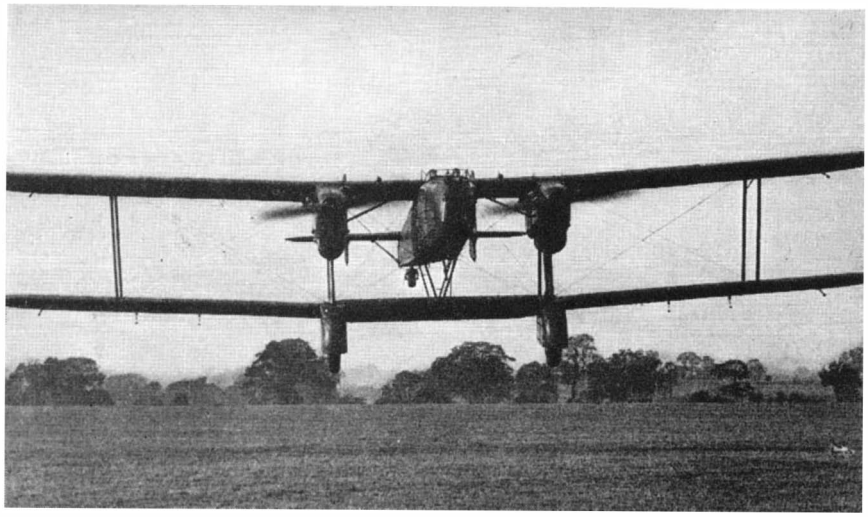
This recognition for the work which Captain William has done was accorded him as the result of a recommendation made by Mr. Albert A. Hopkins, Associate Editor of this magazine. Captain William's camera had been explained to us in confidence some months ago. At that time the recommendation was made and the proceedings were started.

SCIENTIFIC AMERICAN's interest in safety at sea dates back many years and is amply evidenced by awards which have been made in the past in recognition of efforts to decrease dangers of ocean travel. It was in furtherance of this interest that SCIENTIFIC AMERICAN concerned itself with the award of the Arthur Williams Medal.

This scene from a recent motion picture certainly looks frigid, but in reality, it was taken on a warm California day. The chemist co-operated with the director in producing "ice" from sodium hyposulphite which can be used for skating

Growing Pains

JACOBI gave the theory of growing pains the strongest blow when, in 1884, he announced that these vague, ambiguous pains in children are probably associated with rheumatism. He clearly saw the clinical relationship between growing pains and articular rheumatism and even endocarditis. He noted that uncomplicated muscular rheumatism is rare in young children, and at that time he wrote: " 'Growing pains' are not infrequently inflammatory rheumatism, and endocarditis of later years may be traced back to the growing pains which are but dimly remembered." There is no real



A Handley Page Heyford bomber with excellent defense against small planes

evidence to substantiate the old idea that normal growth causes chronic muscular pains. There is timeliness in the contention that the term "growing pains" is a misnomer and should be discarded. Chronic pains in the muscles which can be differentiated from chronic fatigue and definite orthopedic disorders are probably the result of a chronic infection. Many of the muscular pains may properly be classified as the muscular rheumatism of childhood.—*Journal of the American Medical Association.*

Is the Airplane a Danger to New York City?

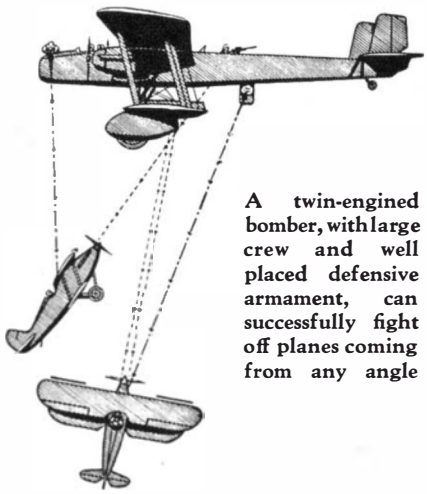
THE well known British aircraft constructor, Handley Page, points out that the large twin-engine bomber has tremendous war-time possibilities in the shape of 2800 pounds of bombs, with a destruction radius of 100 yards, a range of 510 miles in 3½ hours, and ability to operate at 15,000 feet, out of reach of most anti-aircraft guns. Moreover, the twin-engine bomber such as the Handley Page Heyford shown in one of our photographs can fight off the speediest single-seater fighter. Thanks to its fore-and-aft guns, the attacker is always within the angle of fire of the bomber, and since the bomber gunners have nothing to do but shoot and are not bothered with piloting at the same time, their aim is likely to be more deadly than that of the lone pursuit pilot.

The case for such aircraft is, then, that the bomber is deadly, and can withstand the efforts of the defense. Why would not a bomber be therefore a most deadly weapon against a modern city?

Major General H. G. Bishop, writing in *The New York Times* has much to say in rejoinder. The General can handle his pen as effectively as his sword. We quote from his article: "More than 40 percent of the area of the average American city is unoccupied space—streets, alleys, parks, and vacant lots. A projectile without correct aim, therefore, has little more than a 50-50 chance of hitting a building. The physical damage that a 500-pound high-explosive bomb would do in either case is highly conjectural. Unless the bomb is accurately placed more than half of its effect is lost.

"Aimed bombing, in which the intention is to hit a definite object, is a complicated process requiring special apparatus and highly trained operators. The instant a bomb is released from a ship, it has the velocity and direction of the ship. Gravity, wind, and other disturbing factors instantly act to change this motion and its intensity. Hence it is necessary in aimed bombing that the ship is traveling at a known or predetermined speed—also it must travel upon a predetermined course and at predetermined altitude. . . . The greater the altitude of release the more are the errors in the necessary calculations multiplied."

Visualizing a bomb attack upon New York City the General says: "If it hit the Empire State Building . . . only a few of the topmost floors would be wrecked."



A twin-engined bomber, with large crew and well placed defensive armament, can successfully fight off planes coming from any angle

Further discussing the attacking fleet: "Such a fleet must have a secure base within 300 miles of the city of its objective, where the ships may be repaired, serviced, and loaded."

The General concludes that bombing operations against cities will be far less dangerous than is often taken to be the case. He cites history to show that every new weapon of offense has been met by a new weapon of defense.—*A. K.*

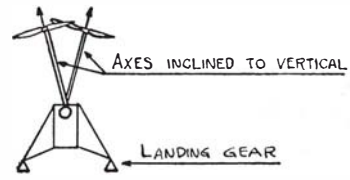
The Latest in Helicopters

PHOTOGRAPHS of the Florine helicopter have recently appeared in European newspapers, with unfortunately very little in the way of descriptive material. The helicopter has been built by Nicolas Florine, a Russian who is now a naturalized Belgian subject, under the auspices of the Belgian Aeronautical Service. The new machine has remained in the air for nine minutes and 58 seconds, a world's record, but nothing is available regarding the forward speed.

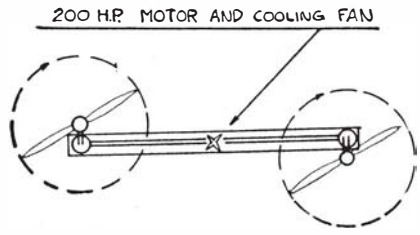
In this craft, the two lifting airscrews are driven by gearing from a central air-cooled engine. Above the engine there is a small airscrew which serves to cool it. The pilot sits in the open trusswork, which is of steel tubing. The landing gear is composed of four symmetrically disposed and designed pads or "footballs," so that it does not matter which way the machine lands. The gross weight is about 1500 pounds, and the motor develops 200 horsepower at full power, of which only 160 is normally utilized. Each of the lifting airscrews has a diameter of 23½ feet.

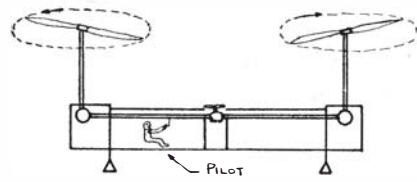
We imagine that the control of the helicopter depends on the pilot's ability to change the pitch of one or other of the airscrews. Suppose that the forward airscrew has its positive pitch slightly diminished. Its lift will decrease and the craft will nose downwards. Immediately a forward component of thrust will be brought into play, giving the helicopter a measure of forward speed. This is only a first elementary hypothesis, however. The question of lateral control and of steering probably also depends on suitable pitch variation and the forward speed is likely to be low.

There is one very important difference between the Florine helicopter and all other direct lift machines to date. In previous designs, two airscrews are employed rotating in opposite directions. The airscrew is turned by torque from the engine, and therefore—action and reaction being equal and opposite—it exercises a turning moment on the aircraft. If only one screw were employed, or two screws turning in the same direction, the aircraft as a whole would turn 'round and 'round to the discomfiture of the pilot. In the Florine machine, both screws turn in the same direction. How then is this disturbing spinning effect eliminated? Since the airscrews are inclined to the vertical in opposite directions, as illustrated in our sketches, the



Sketch of front of new helicopter





How the lifting screws and motor are placed in the Florine helicopter

horizontal components of the thrusts set up a turning effect equal and opposite to the motor turning effect.

Our readers may ask: What is the advantage of such a design? The advantage is that in this manner the gyroscopic effects of the two airscrews do not neutralize one another, and the gyroscopic effects tend to give the helicopter stability, which is a very important point.

The first flights have shown such stability, and also ease of control. Therefore more detailed information will be awaited with interest.—*A. K.*

Stark on Instrument Flying

A LITTLE pamphlet by Howard C. Stark on instrument flying now reappears as a text-book and is a very welcome addition to the meager literature on the subject. Mr. Stark is a veteran and skilled transport pilot; his book and system of instruction have gradually evolved out of his own experience.

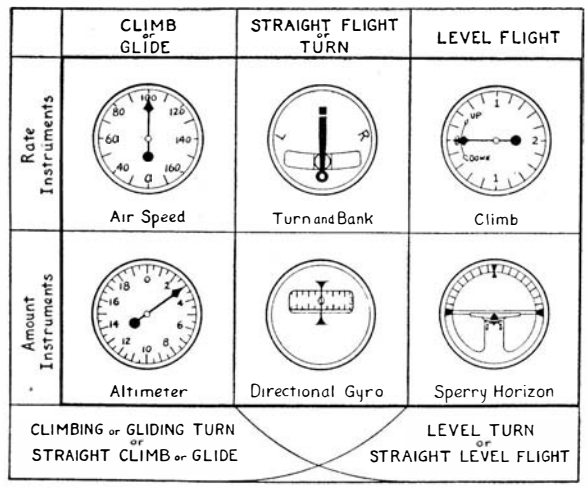
As illustrated by one of the drawings, an airplane has six degrees of freedom. It can move along three axes: Forward along the X axis; up or down along the Z axis; sidewise along the Y axis. Also, it can turn about each of these three axes: Pitch up or down about the Y axis; turn or yaw about the Z axis; and roll or bank about the X axis.

Flight instruments can be classified into two groups as follows: 1. Those which show the *rate of motion* along these axes, or the *rate of turn;* 2. Those which show the *amount of motion* along these axes or the *amount of turn.* Mr. Stark's Aircraft Instrument Classification table, the first ever presented, is reproduced in these columns. Twelve indications are thus needed to complete the pilot's knowledge of the airplane's motion.

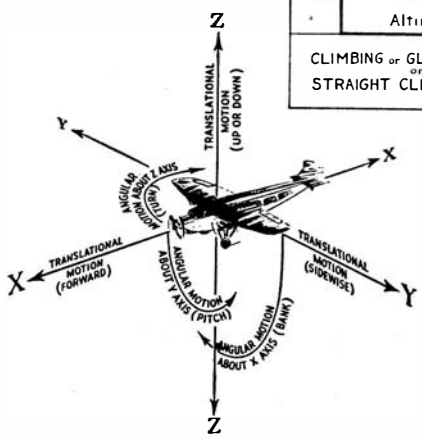
A typical arrangement of seven instruments which give all the necessary indications is shown in one of the photographs. The air-speed indicator shows how fast the aircraft is traveling; the drift indicator—not so frequently employed—shows the speed in a lateral direction; the rate of climb indicator how fast the airplane is moving up or down. Hence they are properly classified as *rate* instruments.

The radio signaling system and the radio beacon show the distance traveled along a course or the amount of deviation from the course. The altimeter shows how much the airplane has risen or fallen. Radio aids and the altimeter are therefore properly classified as *amount* instruments.

The ball of the bank indicator should stay in its central location for a correctly made bank—when the centrifugal force is correctly balanced by the inclination of the ship. The turn indicator is based on indications of the air pressure at either wing tip, transmitted to a pressure gage, and therefore shows the rate of turn. The pitch indicator is similar to the bank indicator and shows approximately the rate at which the plane is nosing up or down. These, therefore, are *rate* instruments by a broad interpretation.



***Right:* Chart showing the instrument combinations used in blind flight. *Below:* A plane in the air has six degrees of freedom and can move along three axes. See the text**



The Sperry Horizon is based on the vertical position in space maintained by a gyroscope and therefore shows the *amount* of displacement from the vertical in either a longitudinal or a transverse plane. The directional gyro does the same for angular displacement from the true course, and so does the compass.

Another drawing shows the instrument combinations actually used in blind flying. If correctly interpreted they give the pilot complete aid in blind flying. Such correct use is no longer a matter of the pilot's own experience or inspiration. Certain definite rules must be followed.

For the rate instruments the following 1-2-3 order applies for returning to or maintaining straight level flight:

1. Center the turn indicator with rudder only. The ship is then no longer turning.

2. Center the bank indicator with ailerons only. Since the ship is no longer turning, due to maneuver 1, a central position of the ball means that the plane is on a level keel.

3. Center the climb indicator and control the air speed indicator with elevators only. Maneuvers 1 and 2 have set the ship straight directionally and laterally. Maneuver 3 insures level horizontal flight.

Maneuvers 1 and 2 must be carried out in very close coördination. The use of too much rudder without the coördination of the ailerons will cause skidding; that is, undesired lateral motion.

The use of the amount instruments is more direct and natural and requires less rigid rules, since they give at all times a direct and continuous picture of the position of the airplane. All the pilot has to do is to keep the miniature airplane of the Sperry Horizon parallel to the horizon bar. If the miniature airplane is thus held parallel the directional gyro gives assurance that there is no turning off the course.

An airplane instrument board with the seven necessary instruments

Cross-checking is possible between the rate and amount instruments. A pilot who has learned the 1-2-3 order and the system of cross-checking should be moderately happy even in the thickest weather.—*A. K.*

AIRCRAFT INSTRUMENT CLASSIFICATION

AXES	MOTION	RATE INSTRUMENTS	AMOUNT INSTRUMENTS
TRANSLATION			
1. Longitudinal	Forward	Air Speed Indicator	Radio
2. Lateral	Sideways	Drift Indicator	Radio
3. Vertical	Up and Down	Rate-of-Climb Ind.	Altimeter
ANGULAR ROTATION			
4. Longitudinal	Roll or Bank	Bank Indicator	Sperry Horizon
5. Lateral	Pitch	Pitch Indicator	Sperry Horizon
6. Vertical	Turn	Turn Indicator	{ Directional Gyro { Magnetic Compass

Weather Broadcasts Aid Motorists

WEATHER information disseminated for airmen by the Department of Commerce also aids automobile drivers in planning trips, according to information received by the Department from agencies which furnish route information for travelers on the highways.

Comments upon this use of weather broadcasts have been received by Rex Martin, Assistant Director of Aeronautics in charge of the air navigation division, as a result of his suggestion that radio manufacturers offer automobile receiving sets capa-

ble of receiving the frequencies upon which these reports are broadcast.

The Beacon National Tourist Bureaus reported that since it had arranged, in 1930, to obtain the airways reports, it has supplied meteorological information to more than 20,000 motorists.

A letter from the Nashville Automobile Club said: "Accurate weather and precipitation conditions influence many routings and the public is growing more and more to demand weather facts. We are grateful that we have you on whom we may call for changing conditions. The government has done a great thing for the automobile as well as the air traveler in establishing radio stations. More than once to our certain knowledge discomfort or even hardship and suffering have been averted by accurate information given by you."

A special portable ladder used in the shops of Eastern Air Transport at Atlanta, Georgia. With this ladder it is easy to reach many out-of-the-way parts of an airplane for complete inspection or maintenance

New British Airliner

WE have become so accustomed to transport airplanes of the low wing cantilever type, without external bracing, that a biplane with struts and wires seems a little old-fashioned, but the British de Havilland 86, by its excellent performance, demonstrates that the old biplane principle can still be usefully employed.

The British are rapidly pushing the extension of their Asiatic services to Australia and the D.H. 86 is to be put into service between Singapore and Port Darwin in New South Wales, Australia. It has a maximum speed of 170 miles per hour, a cruising range of some 460 miles, and is to carry ten passengers, a crew of two, and complete passenger, wireless, and navigation equipment.

The first point of interest is the use of four engines (Gipsy six-cylinder of 184 to 205 horsepower), all faired carefully into the lower wing. Even with four engines the total horsepower is moderate compared with American standards. If a multiple power plant adds to safety, then the use of four engines is desirable in spite of increasing complexity. With one engine out of commission the plane can fly indefinitely; even with both engines on one side out of commission the ceiling is 3600 feet.

Another interesting feature is the use of very large aspect ratio. With cantilever monoplanes, the aspect ratio (which may be roughly defined as the ratio of span to chord of the wing) is generally around 6. Here the aspect ratio is 12.3. This aspect ratio is possible because the wing is supported by struts and wires. Furthermore, the wings are tapered, which is far from customary in a biplane. As a result of the taper, only one strut between the wings is necessary at the tip, although two struts are placed between the wings farther inboard. The result is that the biplane cellule is as efficient aerodynamically as the short aspect ratio monoplane. (Efficiency, of course, increases with aspect ratio.) The fuselage is nicely streamlined and occupies the entire gap between upper and lower wing.

In spite of the excellent performance figures, the power loading is high; namely, 11.2 pounds per horsepower, a far higher figure than American practice indicates. —*A. K.*

The Navy Takes Up Gliding

THE Navy's most enthusiastic and skilled glider pilot, Lieutenant Commander Ralph S. Barnaby, has succeeded in his intelligent and persistent campaign. Henceforth half of each incoming class at the Pensacola air-training station will undergo their elimination period in a course of glider training. Until recently all candidates for Pensacola were given preliminary airplane instruction at Hampton Roads or San Diego, and undesirable students were weeded out by this process. The procedure was costly and required 30 days of intensive training.

Now, four selected officers employing two gliders will eliminate men as a result of the glider training course. The methods to be employed will be similar to the usual practice of most of the gliding schools of the country. The student is towed behind an automobile at the end of a 1000-foot cable. At first, while mastering the rudimentary maneuvers such as keeping wings level and using rudder to prevent turning, he is allowed to rise only a few feet off the ground. Gradually the altitude is increased until at an altitude of 600 feet in the air, the student cuts loose from the cable. At this altitude he is able to perform such maneuvers as S-turns, figure eights, spirals, and precision landings.

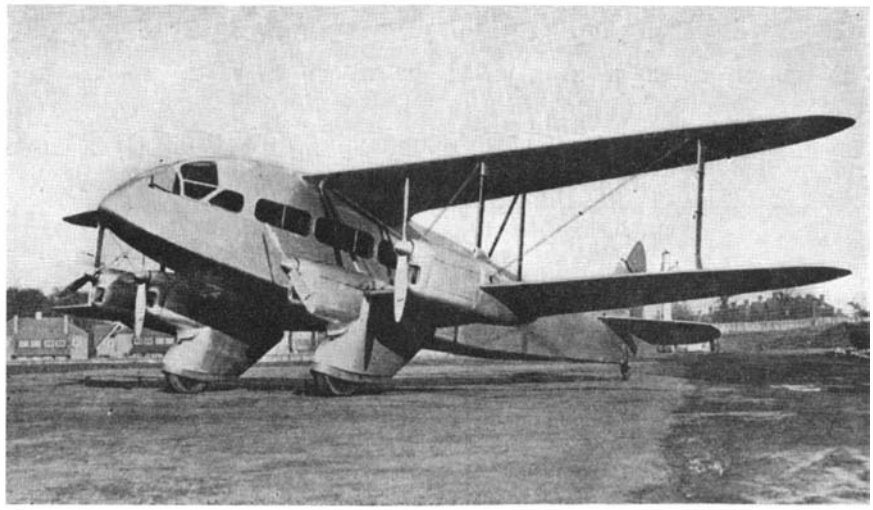
Several advantages are claimed for the new system. After about 38 "drags" behind the automobile, the student can perform all such maneuvers with ease, and these drags take only a fraction of the time and expense that airplane training would involve. Further, the glider pilot develops complete

Official Photograph, U. S. Navy

Lt. Comm. Ralph S. Barnaby who advocates glider training for flyers

confidence. From the first the glider student goes into the air alone, is entirely dependent on his own resources, and corrects his own errors. When the time comes for him to solo an airplane he has already been in sole control of a heavier-than-air craft. Self-confidence is perhaps the greatest asset that a pilot can have. Again, as the glider pilot flies "by the seat of his pants," as H. Latane Lewis puts it, he is more likely to develop an air sense.

There are some drawbacks to the method. The technique of the engine, particularly the troublesome effects of engine torque, is not absorbed in a glider. The glider can be landed almost anyhow without damage and this militates against good landings



The new British airliner described on this page

with a powered aircraft. Glider training is not dangerous but minor damage to equipment is all too frequent.

Nevertheless the plan is working out nicely, and Barnaby is still of the opinion that the Navy will save expense and weed out unlikely men with less danger and trouble.—*A. K.*

Steam Turbine for Aircraft

DESIGNERS of large seaplanes always turn longingly to the possibilities of large steam units. Most reciprocating steam engines are evidently out of the question because of their complexity and weight. Gas turbines are still a matter for the distant future, because the materials we have available to-day will not withstand the enormous gas temperatures. The steam turbine seems most appealing. Here the difficulty lies in the size of the boiler and in the condensation problems. An ingenious solution is described in *Flugsport*. The small 20 horsepower unit which has been developed is illustrated in our diagram.

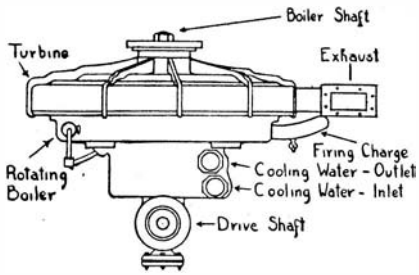


Diagram showing the important parts of the turbine for aircraft

The boiler itself rotates! This is the first time we have ever heard of a rotating steam boiler. It revolves on the same axis as the turbine proper, but in the opposite direction so as to take up the reactions at the issuing jets. Owing to the fact that the boiler (consisting of a series of U-tubes) rotates within a stationary housing, heat transmission from the burning gases to the water inside the tubes is rapid, and the boiler is small and gets up steam quickly. The necessary steam pressure is secured by the action of centrifugal force. Condensation takes place within the machine itself, and the radiator is used only for cooling purposes just as in the internal combustion engine.

Our diagram illustrates the compactness and simplicity of the new engine, which while rated at only 20 horsepower, can stand an overload of 100 percent and can be run 8000 hours without overhaul.—*A. K.*

Unshrinkable Fabrics

UNSHRINKABLE fabrics seem to be within reach of the textile manufacturer as a result of long research by the Cluett, Peabody Company which has finally placed the process of shrinking upon a scientific basis. In the new process, the finished cloth is passed through an ingenious mechanism comprised of detensionising or compressing surfaces, which grip it and exert enormous compressional force in a direction parallel with the cloth face. In other words, the threads which have been previously pulled out are pressed back to any predetermined degree. As the behavior of every type of fibre under manufacturing conditions is known, it is a matter of simple calculation to find the degree of compression required for any fabric.

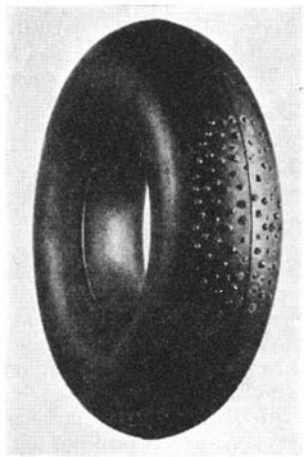
An interesting feature of this new process is that the appearance is improved, and the cloth becomes softer, handles more pleasantly, and is given a beautiful lustre.—*A. E. B.*

Inner Tube Improvements

TWO new passenger car tire tubes, one of which will not be cut to ribbons if run flat, and the other a puncture sealing tube incorporating new principles for a product of this kind have just been introduced by The B. F. Goodrich Company, Akron, Ohio.

The first is made of specially compounded yellow and black rubber in two sections. The entire tube is first made of one tough rubber stock, and then a layer of abrasion resisting rubber is vulcanized over the inside circumference of the tube. This strip is made to give resistance to chafing at points where the most chafing action occurs, and afford double protection from common causes of tube failure.

The puncture sealing tube is named Seal-O-Matic. It is believed entirely different in construction from previous products of this type, incorporating a layer of plastic gum rubber inside the tube wall. This rubber, specially compounded for this one purpose, flows into any hole that may be driven into the tube without allowing the tube to lose the air. The tube, in contrast to other products of this type, is so light that it can be used on the smallest cars, allowing them to ride as easily as on ordinary tubes.



Above:* How holes are sealed in new inner tube when deliberately punctured as at *right

Competition in Kegs

WHITE oak has long been the preferred wood for the manufacture of beer barrels. According to the United States Forest Products Laboratory, there are abundant sources of red oak that might profitably be used for this purpose. Laboratory authorities state that for beer barrel purposes the properties of red and of white oak are similar in most respects. The outstanding difference that has hitherto barred red oak is that in white oak most of the pores in the tree become plugged by a natural deposit called "tyloses" whereas in red oak no such filling-in occurs; hence the problem reduces itself to one of practical means of plugging the open pores of the red oak.

Accordingly, the Forest Products chemists have developed a process of stopping the pores of the red oak by filling them with a suitable form of pitch, under pressure.

Commenting on this achievement, *Food Industries* says editorially (and a bit ironically) that "steel has no pores, either"—a reference to the growing popularity of stainless steel kegs for the shipment of beer.—*A. E. B.*

No Waste Between Toots

LOCOMOTIVES of the Canadian Pacific Railway will no longer show "the white feather," due to a repair program recently put in force.

The wisp of steam escaping from the top of many engines is called by that name by railroad men. A thing of beauty to the public, it is considered a waste by the operators who fix the blame on the wearing down of the valve seat of the whistle. Now the efficiency engineers are having the old type of seat replaced by Monel metal so that there will be no waste of steam between toots.

Today's Common Drinking Cup

YOU may have thought that the dangerous disease-carrier, the common drinking cup, had disappeared. But it has merely changed its form and still endangers your health in a most insidious way. The editor of the *American Journal of Public Health* calls attention to its fresh menace:

"The common drinking cup has never really been abolished. We still have it, though not in the same form as before. Now it is in the form of glasses, dishes, and tableware inadequately cleansed between servings.

"Go to almost any soda fountain, in any city; watch the attendant pluck a glass from the counter, swish it about hastily in a basin of muddy-looking tepid water, rinse it quickly in cold water, then use it to serve another customer.

"That glass is worse than the common drinking cup! Its superficial washing has served only to bring it into contact with germs from many other glasses 'washed' in the same water.

"Influenza, the common cold, tuberculosis, pneumonia, scarlet fever, diphtheria, whooping cough, and Vincent's angina, are

among the principal diseases that can be transmitted by unclean eating utensils. Pathogenic organisms (disease germs) are not removed by common methods of washing. After they are used and hand washed, more than 20 percent of the organisms remain adhering to eating and drinking utensils.

"About 92 percent of all communicable diseases are transmitted through the mouth and nose. Surely there is no better place to break the chain of saliva-borne and food-borne infections than at eating and drinking places.

"Clean food, clean hands, clean dishes: These three hold great hope for the control of saliva-borne infections."—*Science Service.*

Steinmetz Smoked Even When Swimming

THIS accompanying picture of Dr. Charles Proteus Steinmetz, known as "The Modern Jove" because of his pioneer work in artificial lightning investigations,

A hitherto unpublished photograph of the late Charles Proteus Steinmetz

shows this great scientist carried his cigar even while swimming. This picture, heretofore unpublished, was just found in Steinmetz's private collection of photographs.

Dr. Steinmetz, who died 10 years ago, would have been 69 years old on April 9. In tribute to his memory Schenectady, New York, his home town, joined with General Electric in a three-day observance starting with a radio broadcast which brought back his voice to the ears of thousands, and closing with a testimonial dinner by the American Institute of Electrical Engineers to its past president. Steinmetz's voice was recorded on film in General Electric's laboratories long before the day of the talking movies, and it is this film which was used in the broadcast.

Trees Protected by Lightning Rods

PROTECTION against lightning has been given to a number of fine trees in Maryland, some of them of historic interest, by equipping them with lightning rods. Success with this method over a period of 17 years is described by Dean J. B. Whitehead of the Johns Hopkins University engineering faculty, in a recent issue of *Science.*

The equipment is quite simple. Seven-strand copper cable is led to the top of the tree, its end unbraided to give a number of free discharge points, and the lower end soldered to the top of an iron pipe driven 11 feet into the ground. Some trees have been given several such rods. Several of the trees thus equipped had been struck by lightning one or more times before the installation of the rods, but since then no protected tree has been damaged by lightning, though in some cases other trees nearby have suffered.—*Science Service.*

Artificial Wool from Jute

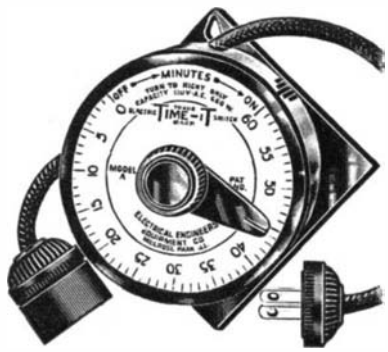
A PROCESS for converting jute into so-called "artificial wool" is reported by *Chemical Industries.* It is stated that brief immersion of the fibers in caustic potash of 25 to 30 percent strength is followed by a drying treatment in a rotating drum. The final product can be woven alone or in mixtures with natural wool, cotton, or silk. —*A. E. B.*

Automatic Timing Switch for Household Use

AN all-electric timing switch which can be used for controlling any ordinary household circuit, such as that for the radio, fan, or lights, as well as heating pads, electric heaters, and so on, has recently been placed on the market by Jones and Lohley, Chicago, Illinois. This timing switch is inexpensive and entirely automatic, requiring only to be plugged into the circuit of any electric device which is to be controlled. Turning the pointer to indicate the time for which the device is to operate is all that is necessary.

"Time-It," as this switch is known, is adjustable for any period from the minimum of 15 seconds to a maximum of one hour. Another model is also available which will turn the power on at any predetermined time and will turn it off again at any later time up to 24 hours.

A device of this nature can be used to cut off appliances automatically after you fall asleep or can be used to extinguish



A new electric timer that can be used to control household circuits

garage lights after you have driven out or after putting the car away for the night. Many other applications will, of course, suggest themselves.

New Glass Passes Light, Blocks Heat

A NEW and remarkable type of window glass that allows light to pass through but refuses passage to heat has been developed by the Corning Glass Works. The new glass, christened Aklo, transmits 70 percent of the visible energy in the sunlight which strikes it, but holds back the heat rays so that barely 30 percent of them pass through. Thus the Aklo window pane brings in the wanted light with a minimum of the summer heat. Energy in summer sunlight is distributed with roughly 44 percent in the visible region, 4 percent in the ultra-violet, and 52 percent in the infra-red or heat rays.—*A. E. B.*

The special grid bottom in this can permits circulation of the salad oil

Aluminum "Tin Cans"

ALUMINUM containers for packing tuna have been introduced by the Point Loma Tuna Packers, Inc. The new can, the result of four years of experimental work, offers a number of advantages over existing types of containers. Made of aluminum, which is non-toxic, the cans have no effect on the taste, color, or other properties of tuna. Furthermore the lightness of the can saves shipping costs, while the non-tarnishing appearance of the containers appeals to dealers. The fact that the cans may be reused for salad molds or oven dishes after their original contents have been exhausted is an item to attract the attention of thrifty housewives.

With many cans there is a tendency for the tuna to settle to the bottom, causing the oil to be forced up around the sides leaving a portion of the tuna dry and tasteless. To eliminate this, a special grid bottom is employed in the aluminum can, which permits free circulation of the salad oil.

Sunlight Is Fatal to Rattlesnakes

ONE ordinarily thinks of a desert rattlesnake as basking in the sun all day long awaiting his prey. Surprisingly, however, direct sunshine quickly kills this cold blooded reptile. This was proved by members of the Yosemite Field School in Yosemite National Park.

A specimen rattlesnake was desired for museum exhibit but in a natural unmutilated condition. Members of the school, therefore, placed a rattler in an exposed position where he died in convulsions under the direct rays of the sun in 17½ minutes. The body, after 18 minutes of exposure, felt warm to the touch.

New Underwater "Telescope"

SPECIAL underwater spectacles that allow lifeguards and divers to see clearly beneath the water's surface have been devised by Robert E. Cornish of the University of California's Institute of Experimental Biology.

The normal human eye, developed for vision in air, is a very poor instrument under water, as every swimmer knows. The reason is that the contact of water with the cornea robs the eye of about two thirds of its refracting power. This trouble is avoided in divers' outfits by keeping water away from the eye and looking through a flat window of glass. If the glass is wet by condensation or splashing it loses its advantages.

Mr. Cornish considered the normal eye under water as an imperfect eye and designed lenses to correct it. He has constructed two such lenses, and finds excellent underwater vision with them, newsprint being read without difficulty with one of them, while without the lenses it is not even possible to see that the page contains printing.

Such lenses promise to have value in saving life, where it is necessary to dive for a victim of drowning. Lifeguards now must grope for the victim and must depend largely on sense of touch. Precious moments thus lost have often resulted fatally for the victim.

One type of lens has the advantage that one can see tolerably well either in water or in air. A more rugged construction however is good only under water and is perhaps best used on one eye only. In clear lakes the wearer may see many yards.—*Science Service.*

Radically New Tubular Lamps

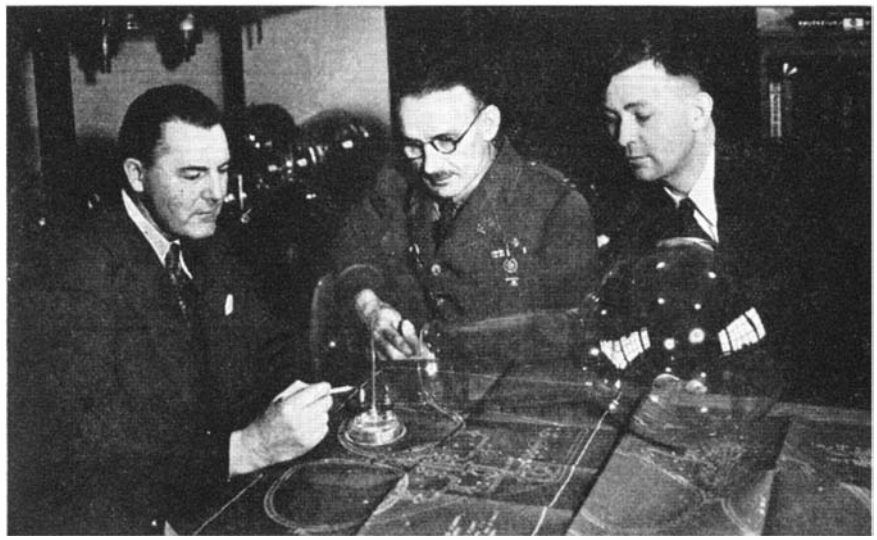
THE development of an unusual line of tubular lamps that can be placed end-to-end to form a continuous sectional line of light in various architectural and other applications has been announced by the Incandescent Lamp Department of General Electric Company at Nela Park, Cleveland.

The new lamps, designated as "Lumiline," incorporate an entirely new technique of sealing a metal base directly to the end of a glass tube without the use of basing cement. Thus, instead of being equipped with a conventional type of base, the new lamps have at each end a special chrome iron contact cap that is sealed directly to the glass tubing. The particular advantage of this construction over the screw base is that by placing the new lamps end-to-end it is possible to achieve a more nearly continuous line of light with a minimum amount of dark area.

The Lumiline lamp employs a single stretched-coil filament drawn out into a continuous line from one end-contact cap to the other. A channel backbone inside the bulb carries the filament along the tube, anchored by wire filament supports attached to the channel backbone and spaced approximately two inches apart.

Lamp Bulbs as Air-Samplers

WHEN Captain Albert W. Stevens, noted United States Army aerial photographer whose photographing of Mt. Shasta, Washington, from a distance of 331 miles made camera history, ascends into the stratosphere in June on a flight sponsored by the National Geographical Society, he will take with him several air-sampling containers designed by General Electric lamp engineers.



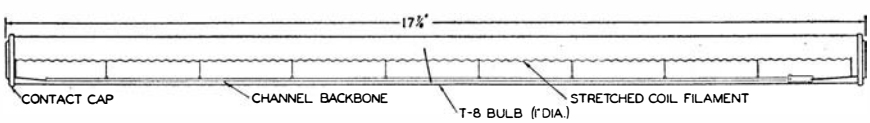
Captain Albert W. Stevens, center, with two General Electric Company engineers, examining a large bulb to be used as an air-sampler in the stratosphere

It is Captain Stevens' intention to bring back to earth with him samples of air at various elevations in the stratosphere, and have them subjected to a chemical analysis by the Bureau of Standards.

The air-sampling containers will, it is planned, consist of specially constructed lamp bulbs of the 10-kilowatt size, equipped with valves for the intake and exhaustion of the stratosphere air, and will probably also be equipped with pressure-recording gages.

Insulating Material of "Rubber and Bubbles"

SAID to be the lightest weight solid substance known, Onazote, a patented insulating material made of "rubber and bubbles" is the most perfect insulator against noise and the most resilient of known rubber compounds. This remarkable new material is described by Harry D. Edwards in *Refrigerating Engineering.*



Above: **A new tubular electric lamp, and *below*, drawing showing how the long filament is braced**

Onazote is made from rubber "dough," of crude or reprocessed rubber with the usual fillers. The dough is partially vulcanized by placing it in a pressure vessel which can be heated externally. Nitrogen gas is admitted until the vessel is filled to a pressure of about 3000 pounds per square inch. Pressure vessel and contents are both heated by steam or other suitable means until a pressure of about 4000 pounds is created. Nitrogen is driven into the pores of the dough and at the same time the expansion of the absorbed nitrogen resulting from the heating causes the dough to expand. In the meanwhile, the application of heat causes a partial vulcanization of dough, so that when it is removed from the pressure vulcanizer it has a consistency of a rubber eraser. Generally, the dough is roughly formed to the shape of the desired article before impregnating and vulcanizing. It is then placed in a mold of the desired form and further heated until completely vulcanized.

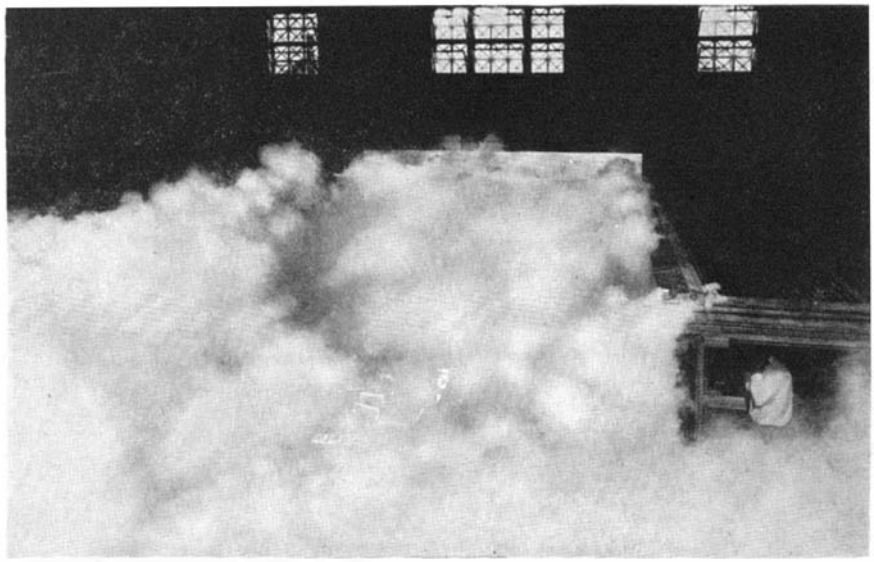
In addition to its excellent insulating properties, Onazote is said to be entirely moisture-proof, of high dielectric strength, vermin proof, and quite inexpensive.—*A. E. B.*

Ravens Know Trick of Military Aviators

STUNTING in the air is not a new thing under the sun. One of the favorite tricks of the military aviator—a quick side roll to an upside down position, followed by a half-loop downward restoring the right side up position and reversing the direction of flight—is known to ravens. Several observations of this turn have been recorded by a German naturalist, J. O. Fulz. —*Science Service.*

The Eugenic Sterilization Movement

THE Japan Race Hygiene Society will soon change its incorporation papers so as to enable it to start a eugenics campaign. Prof. Dr. S. Nagai, its chief, says that the society has decided to present a sterilization bill at the next session of the Diet, which is expected to arouse much discussion. The



Photograph courtesy Federal Laboratories, Inc.

Clouds of tear gas foil bank robbers without doing permanent injury. When the teller sees indications of criminal intentions, he presses a button which releases the gas. Present-day devices of this sort use chloropicrin, bromacetone, and other similar lachrymators which readily volatilize when heat is applied

bill will go beyond voluntary sterilization in order to rid Japan of unsound hereditary qualities. The details of the bill are kept secret, but diseases incurable even by medicine or punishment are to be governed by this act. As to determining who should be sterilized, an institution is to be established, and in case of opposition an appeal to the judicial court will be allowed. The method of sterilization will be simple and will not be a hindrance to marriage. The whole system will be carefully designed and adjusted to the Japanese nation.—*Journal of the American Medical Association.*

Streamlined Pullman Cars

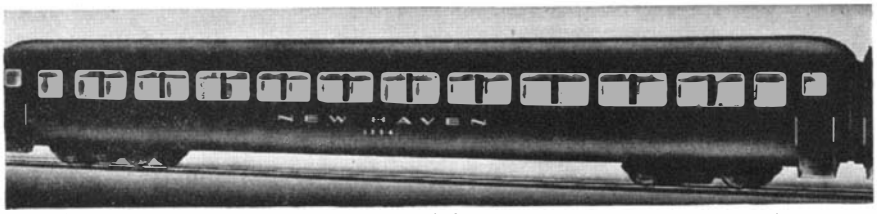
MR. J. J. Pelley, President of the New Haven Railroad, announced recently that the contract for construction of 50 coaches designed for the New Haven by Walter Dorwin Teague has been awarded to the Pullman-Bradley Car Corporation, Worcester, Massachusetts, deliveries to be made in the latter part of 1934.

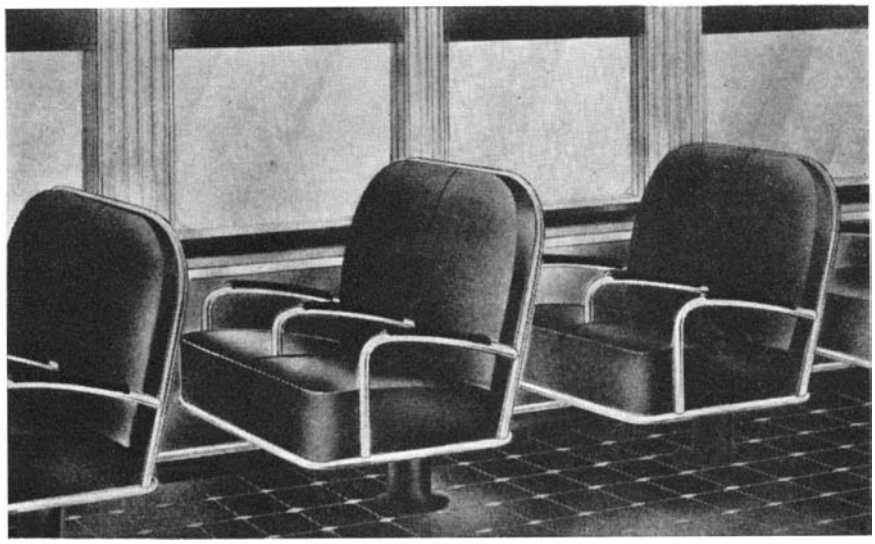
Details of Mr. Teague's design, which embodies radically new principles, were also made public by Mr. Pelley. The new cars will be operated, so far as possible, as unit trains, but are interchangeable with present equipment if occasion demands. The streamlining of the body and the greatly decreased weight, from 135,000 pounds each with present coaches, to 100,000 pounds with the new ones, marks the first adaptation of modern design to standard railroad coaches and will benefit the railroad principally through reduced fuel consumption.

In order to reduce wind resistance by deflecting air currents, an approach to a tubular cross-section has been effected. Because the cars are air-conditioned the usual clerestory has been eliminated, and a "turtle back" roof adopted. By careful design the over-all height of the cars has been reduced 12 inches without sacrifice of headroom inside. All moldings have been eliminated from the sides and the windows, grouped in pairs, will be framed in a round-cornered polished aluminum band.

The interior has been designed for the maximum of passenger comfort and "eye appeal." Easy riding seats, cleanliness, gaiety of color schemes, ample light, have been the designer's aim. Air-conditioning provides an agreeable atmosphere at all times, as well as a quiet ride, noises being reduced to the minimum.

One of the most important innovations from the point of view of the passenger will be in the seats planned on automotive principles. These seats will be made of metal tubing constructed on the "angle of comfort" principle with detachable cushions and backs and molded arms and will weigh 65 pounds per seat less than the present type. An ingenious pivot arrangement will allow for a foursome of bridge.





Above: **New streamlined Pullman, and *below*, seating arrangement in the car**

Mining Bromine at Sea

CHESTERTON, in his "Ballad of the White Horse," makes allusion to the towering imagination in the ancient Irish bardic poetry:

"Tales where a man can swallow the sea
That might swallow the Seraphim."

Such a sea-swallowing stunt is at least partly realized, if not by a man then at least by one of man's works, in a new bromine-producing plant established by the Dow Chemical Company at Wilmington, North Carolina.

This plant daily pumps through itself a literal river of salt sea water, drawing it from the ocean and discharging it again into the Cape Fear River. More than a third of a billion pounds of water—175,000 tons, or enough to float all the heavy-gun cruisers in the United States Navy—is sucked in daily by its monster pumps, and comes tumbling out of its discharge gates. What happens to it on the way through explains why this sober industrial chemical company has done such an apparently fantastic thing.

The sea water is made to yield 10,000 pounds of bromine every day, by dumping into it half that quantity of the cheaper element chlorine. The chlorine has a more powerful attraction for the elements that are united with the bromine in the sea water, forces a chemical divorce, and leaves the bromine free to come out of solution, when it is captured, condensed, and prepared for market.

Bromine is a brown substance, which hovers between gaseous and solid states at ordinary temperatures. Vast quantities of it are used in the process of preparing "ethyl-gas" motor fuels, in photography, in medicine and antiseptics, and in many other ways. Although it is present in sea water in such thin dilution that 175,000 tons of the water will yield only five tons of the chemical, the new process of extraction is so simple as to make the plant profitable, though it works what amounts to the lowest-grade "ore" in the world, with the exception of the pitchblende that yields radium, the South African blue clay in which dia-

monds are found, and perhaps one or two other kinds of treasure-containing dross. But bromine is not high-priced like radium or diamonds, so that extraction of this cheap element from vast quantities of water represents all the more a triumph of modern chemical engineering.—*Dr. Frank Thone, Science Service.*

Knife Blade in Brain 15 Years

FOR over 15 years James P. Sherry of Rochester, New York, carried a knife blade in his brain without knowing it.

Recently, severe headaches, and lameness in one leg led him to seek medical aid. Dr. Charles S. Gallaher, of the medical department of the Eastman Kodak Company, where Mr. Sherry is employed, examined the man, detected an abnormal condition of the eye on the side opposite to the lame leg, suspected a brain abscess and took an X-ray picture which showed the knife blade in Mr. Sherry's brain. A fine scar was then found on his scalp. Removal of the blade by surgical operation resulted in the patient's complete recovery.

Strangely enough, Mr. Sherry was not only ignorant of the blade's being in his brain, but did not even remember ever suffering a head injury. The only possible explanation is that the blade entered his brain at the time of a war injury. Mr. Sherry was struck on the elbow by shrapnel in the Argonne. For hours afterward he was dazed. Mr. Sherry and his medical attendants believe that the knife blade was in the same shell and was driven through the skull by the same burst, probably going in red hot and cauterizing the wound it made. It is understood that the Germans, short of materials toward the end of the war, used odd scrap metal for shrapnel, which would explain how the knife came to be in the shell. —*Science Service.*

Attempts to Accelerate Aging of Liquor

ONE needs only to glance over the whiskey advertisements to realize that the question of proper "aging" for liquor is one which is a vital factor to the distillers. The sudden repeal of prohibition created a demand for good whiskey that could not be met by available stocks. So the burning question with the producers today is: "How can we speed up the 'aging' process?" Foster D. Snell and J. Mitchell Fain, consulting chemists, discussed four known methods of accelerating aging at the recent meeting of the American Chemical Society.

"During the aging process," said Mr. Snell, "the constituents of alcoholic spirits undergo chemical change. A study of the changes taking place in whiskey stored in wood over a period of eight years revealed important relations between the acid, ester, color, and solid content of a properly aged whiskey. In the aging process the acids at first form more rapidly than the esters. Later the esters form more rapidly, so that by the end of the fourth year they are present in the same amounts as are the acids. The amounts of higher alcohols increase in the matured whiskey only in proportion to the alcoholic concentration.

"The deceptive, and to some pleasant, slightly oily appearance of a matured whiskey is due to material extracted from the charred container, and this appearance is of course lacking in whiskies which have been aged in uncharred wood. The improvement in flavor of whiskies in charred containers after the fourth year is attributable largely to concentration rather than to the formation of new components.

"All research so far in this direction may be resolved into four categories. In the first, the liquor is treated with air, oxygen, or ozone, by a variety of processes suggestive of the carbonization of soda water, but using oxygen or ozone instead of carbon dioxide.

"The second method involves exposure to actinic rays which have been found to possess special virtue as aids in accelerating the aging of liquor. Thus in the aging of wines and liquors by the action of ultraviolet light, the liquor is passed over a vapor electric arc housed in quartz.

"The third principal classification involves electrolytic treatments, comparable to electrolysis of water. The passage of an electric current through beverages, as in the case of water, produces a quantity of both hydrogen and oxygen. Sometimes electrolysis is effected in the presence of the substance which the spirits on long standing will extract from oak wood.

"The fourth method involves the use of catalysts. A catalyst is a material which is present during the course of a chemical reaction, and which may change the speed or effect of the reaction without itself being engaged. Among the catalysts used are finely dispersed metal oxides, such as copper, nickel, and titanium.

"There are many other methods which cannot be classified and of which some, I believe, may be valuable to particular distillers, depending upon the individual factors inherent in their plant and equipment."

Although it is entirely likely that one or more of these processes may be developed to a point where artificially aged liquor will be as good or better than "real eight-year old stuff," chemists generally admit that there is still a lot they do not understand about the chemistry of aging and that to date, they can not claim to do the job as well as Old Father Time does it. —*A. E. B.*

A simple bath cap of Cellophane protects the hair in the shower

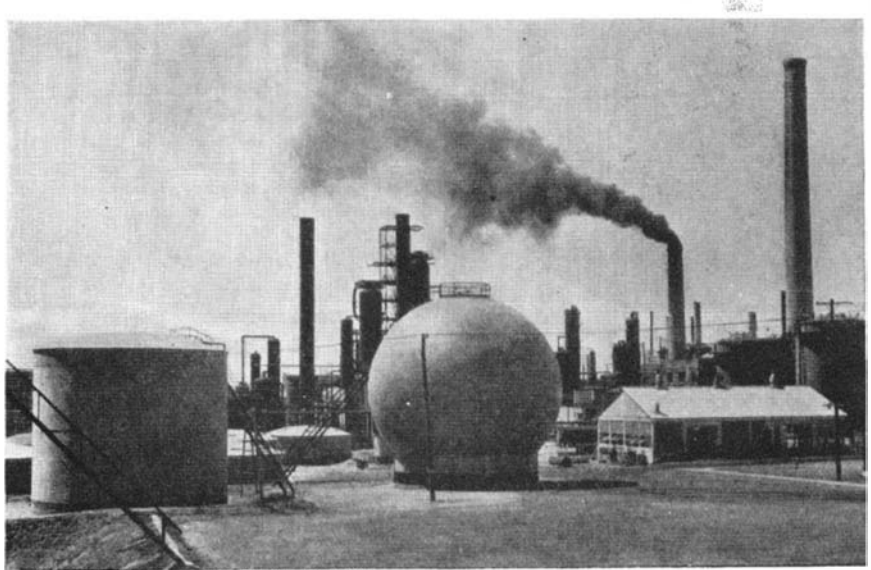
Watermelon Snow

THE southern darkie, with his proverbial fondness for watermelon, would no doubt revel in the snow in a drift high on Lassen Peak in California—for this snow not only is watermelon pink, but smells and tastes like watermelon. This peculiar condition has a simple scientific explanation. The color, smell, and taste are due to a minute plant of the algae family which is present in enormous quantities. Its scientific name is *Protococcus nivalis.*

Premature Babies Have Normal Mental Development

THE mental development of babies born prematurely, sometimes called "midget" babies because of their small size at birth, goes along at the same rate as in their brothers and sisters who were born at full term. Evidence of this was obtained in a study reported by Dr. George J. Mohr of the Pittsburgh Child Guidance Center and Dr. Phyllis Bartelme of the Chicago Institute for Juvenile Research at a meeting of the American Orthopsychiatric Association.

Two hundred and fifty prematurely born white children were studied and compared with 150 of their brothers and sisters who



Photograph courtesy Lincoln Electric Company

A striking view of an industrial plant showing, in the center foreground, a Hortonspheroid gas container composed of plates welded by the electric arc

Courtesy Aluminum Company of America

In this room the walls are covered with horizontal sheets of aluminum. The mouldings, baseboard, and trim were left in natural color, the rest of the walls being done in a rich reddish brown. The curtains are made of aluminum mesh

had been born at term. Both physical and mental growth were studied. The brain and nervous system were apparently not affected by premature birth, but heart, blood vessels, and digestive system were found seriously affected. Such changes as were found in the brain and nerves were the result of weaknesses of the heart and blood vessels.

Weight of the babies at birth apparently had nothing to do with their mental development, although it was a factor in their physical development, particularly among the boys.—*Science Service.*

Scientific American History

WE are so often asked for an outline of the history of SCIENTIFIC AMERICAN that we believe it would be appropriate to reprint from the 13th volume of the Dictionary of American Biography, the brief biography of the present editor's grandfather who built the magazine into an American tradition. This gives the essential facts.

MUNN, ORSON DESAIX (June 11, 1824–Feb. 28, 1907), editor, publisher, was the youngest son of Rice and Lavinia (Shaw) Munn and was born in Monson, Mass., where his father was engaged in business. His first direct American ancestor was Benjamin Munn who in 1649 removed from Hartford, Conn., and settled in Springfield, Mass. Orson was educated at Monson Academy, and, having decided upon a commercial career, began work at the age of nineteen as a clerk in a bookstore in Springfield, Mass. After two years he became a clerk in a general store in Monson and was so engaged when, in 1846, he was asked by his friend and schoolmate, Alfred E. Beach [*q.v.*], to join him in the purchase of a publication called the *Scientific American*, which had been founded Aug. 28, 1845, by Rufus Porter [*q.v.*]. Munn accepted, the firm of Munn & Company, consisting of Beach, Munn, and Salem H. Wales, was established, and office space was secured in New York in the building occupied by the New York *Sun*, a paper then owned by Beach's father.

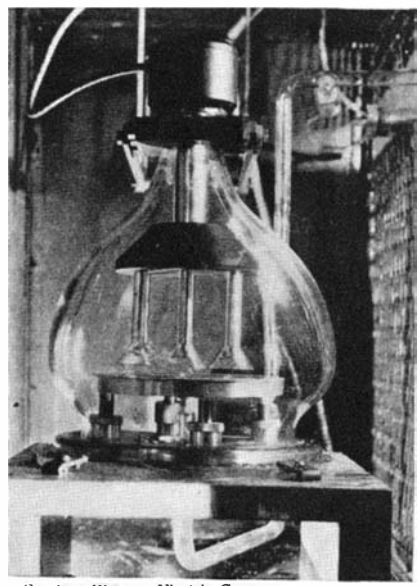
The first issue of the *Scientific American* under the new firm appeared July 23, 1846, and from that time until his death, sixty-one years later, Munn gave his whole attention to its interests. Inasmuch as it was the first American periodical devoted purely to science and mechanics, the partners were constantly brought into contact with inventors seeking information and advice regarding patents. Consequently, they established a patent department, which, coming at a time when patent attorneys were practically unknown, met with immediate response. Under the directorship of Judge Charles Mason [*q.v.*], a former commissioner of patents, the business grew at a rapid rate, necessitating the opening of an office in Washington, D. C., and at the time of Munn's death over 100,000 patents had been secured by the department for clients. Properly to describe and illustrate the interesting exhibits at the Centennial Exhibition of 1876, the partners began in that year the publication of the *Scientific American Supplement*. Its success led them to continue it as a weekly review of current scientific literature and to add also articles too long or too technical for the ordinary reader. About 1890 they began still another publication, *La América científica e industrial*, designed for the Spanish-speaking peoples of South America. One of the features of the *Scientific American* was its information bureau; and in view of the many requests for data on home building and furnishing, Munn began in 1885 the publication of a monthly magazine devoted to this subject. It appeared for a time as the Building Edition of the *Scientific American*, but in 1905 it was remodeled and issued under the name *American Homes and Gardens*. Aside from his business, Munn's chief interest centered in his farm near Orange, N. J., and in his prize stock of Dutch belted cattle. He married Julia Augusta Allen of Monson, Mass., in 1849, and at the time of his death was survived by a son.

From Gummy Nuisance to Useful Plastic

THE sticky, resinous gum, which has plagued the producers of cracked petroleum gasolines by gumming up stills and condensers is now being converted into a useful product, a new synthetic resin. Instead of trying to eliminate the gum, the job now is to get more of it! This new type of synthetic resin, useful for varnish and for molded articles, is being made by the catalysis of petroleum hydrocarbons, according to A. D. Camp, writing in a recent issue of *Chemical and Metallurgical Engineering*. It is a hard, brittle material, having a melting point of 110-115 degrees, Centigrade. It is soluble in practically all hydrocarbon solvents, and insoluble in methanol, ethyl alcohol, and acetone. The resin is readily soluble in drying oils such as linseed and china-wood oil, and with the latter it makes varnishes which dry more rapidly than those made with any type of resin heretofore known.

In the molded plastics field, petroleum resins have been used to some extent by compounding them with certain fillers and plasticizers. They have been used for the fabrication of steering wheels, tool handles, electrical fixtures and many articles to which molding resin mixtures are now being applied.

The process of manufacture of petroleum resins consists in treating a cracked distillate containing hydrocarbons such as olefines and diolefines in the presence of a metallic halide catalyst under carefully controlled conditions. By modifying the conditions of treatment, the properties of the resultant resins can be varied widely.—*A. E. B.*



Courtesy Western Electric Company

High-quality granular carbon type telephone transmitter diaphragms are now made of duralumin with the electrode area in the center covered with a thin gold coating deposited by cathodic sputtering. The vacuum chamber in which the sputtering is done is shown *above*, and one of the diaphragms with the gold center applied is illustrated in the circle at the *left*

Frozen Milk

H. A. HARDING, Ph.D., chief of the Dairy Research Bureau, The Mathews Company, Detroit, has called attention to interesting and striking experiments made by Paul W. Emerson, M.D., instructor in pediatrics, Harvard Medical School, the results of which tend to controvert the theory that freezing has a deleterious effect on the physical properties and nutritional value of milk. Doctor Emerson's studies showed that

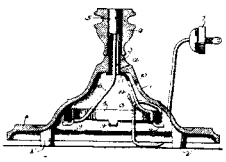
(*Please turn to page* 323)

RECENTLY PATENTED INVENTIONS

Conducted by A. P. PECK

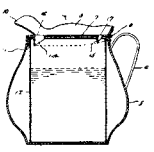
Lamp Cord Retaining Device

Patent No. 1947517. Louis Brosilow, William Markoff and John Orosz. In order to provide for a simple and practical device which may be incorporated in floor or table lamps to receive and hold the unused portion of the attached wire or cord, the device shown in the illustration at the left has been patented. Within the base of the lamp is provided a reel for receiving and holding the cord, so that only enough need be withdrawn to connect the lamp to the nearest electric outlet.



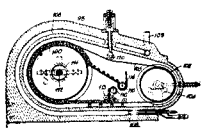
Pitcher for Using Cans of Milk

Patent Number 1948997. Vincent Vaverek and Joseph Heline. Cans of evaporated milk or other liquids can be easily used in this invention which provides a pitcher-like container for such cans. In use, the can is placed within the container and the hinged top is forced down. Two sharp projections within the lid punch holes into the top of the can and provide for the escape of the liquid as well as the entrance of air. Thus the can is held securely and pouring the liquid from it is made more convenient.



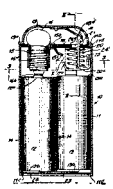
Briquettes

Patent No. 1948471. Henry O. Loebell and Albert L. Klees. This newly invented process for preparing carbonized fuel briquettes concerns the high-speed production of uniform briquettes from mixtures of carbonaceous materials and particularly those of relatively low volatile content, such as anthracite coal and low volatile bituminous coal, to which have been added suitable binders such as various tars and pitches. In our reproduction herewith is illustrated a device for producing these briquettes in quantity using final carbonization temperatures of 1200 to 1800 degrees Fahrenheit.



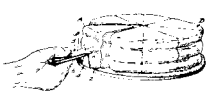
Flash Light

Patent Number 1948613. Otto C. Britsch. This patent pertains to simple portable lighting devices and particularly to pocket battery flash lights. These flash lights are so designed as to be rugged in construction to withstand hard usage and still are small and compact enough to be readily carried in the pocket or handbag. They are furthermore convenient to handle and simple to manufacture. In the type shown, a lid covers the bulb; when the lid is raised a switch is automatically operated. Two small flash light cells are held in the case. When the lid is closed it protects the bulb from breakage.



Cake Knife

Patent No. 1948592. William L. Nelson. A newly devised cake knife which has several desirable features is the subject of this patent. The knife is formed from one sheet of metal and is cut and bent so that it takes the shape shown. A piece of cake can be cut with the long blade of the knife and then removed by sliding the blade under the piece, at which time two prongs are forced into the back of the slice, thereby making it possible to remove the slice without the usual balancing effort being required. The forked part of the handle may be slightly compressed so as to hold the cake firmly and to facilitate removal.



Preserving Proof of Invention

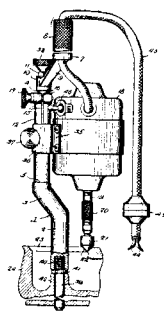
EVERY inventor who is working on a device which he contemplates patenting should first prepare sketches and a description of his invention, which should be dated and witnessed by at least two persons. The inventor has thus established the date of his disclosure, and such evidence should be deposited in a safe place from which it may be produced when needed.

When an invention has been completed, it is advisable to file an application for patent without delay. However, we realize that many inventors today do not have sufficient funds to meet this expense, nor have they safe places in which to keep their disclosures. Therefore *Scientific American* will undertake to act as a depository for such documents. These will be held in safekeeping for two years (unless withdrawn by the depositors) and then destroyed without opening.

To take advantage of this offer, place your papers in a sealed envelope endorsed with your name and address and marked "Not to be opened." Then enclose this in another envelope addressed to A. P. Peck, Associate Editor, Scientific American, 24 West 40th St., New York, N. Y., and mail. —*The Editor.*

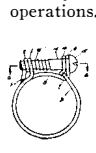
Valve Seat Grinder

Patent No. 1948792. Clifford C. Lee. Grinding the valve seats in internal combustion engines is always a problem. This patent describes a method whereby these seats may be ground accurately and rapidly by means of rotating grinding points operated by an electric motor. By the provision of a suitable upright, which supports the motor, the grinding element is always situated in the proper position for producing the correct angle on the valve seat face. A series of adjustments permit changing the position of the various parts so that valve openings of different sizes may be worked upon with a minimum of effort. The vertical support for the motor is inserted in the valve guide and as the grinding point is turned it describes a true circle around this center.



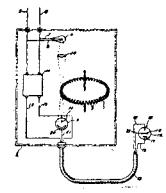
Hose Clamp

Patent No. 1947715. Lawrence H. Heuer. This newly invented hose clamp has a body made entirely of wire, shaped by means of bending operations. The part which engages the clamping screw is formed in a spiral of the same pitch as the thread of the screw. The part which engages the head of the screw is of such size as to allow the screw to pass through it. This eye is so arranged by a bending operation as to resist the frictional turning action of the screw-head. When the clamping screw has been turned into position, the whole device is held rigidly around the hose.



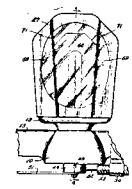
Portable Stroboscope

Patent Number 1948740. Douglass A. Young. For testing electric meters, it is desirable to determine the exact speed of the meter disk and thus compare the speed with that of the disk of a standard meter. The object of this invention is to provide portable apparatus which will do this work, in which a grid-glow tube is caused to give off intermittent flashes of light in accordance with the speed of the standard meter disk, whereby stroboscopic comparisons may be made of the speed of the disk of the standard meter and that of the meter under test. To eliminate flickering of the grid-glow tube when used on standard low-frequency voltages, a high-frequency voltage from a special source is impressed on the tube.



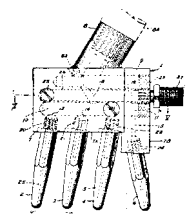
Headlight Construction

Patent No. 1948264. Martin R. Hoag. This patent pertains to headlights for automobiles and the like, said lights to be so arranged that the reflector turns as the vehicle is steered and thus illuminates the road directly ahead regardless of the angle through which the vehicle may be turning. In this particular type of headlight, which employs a tubular bulb, it is claimed that a relatively bright beam of light is projected directly in front of the automobile with an area of diffused illumination on each side. A relatively simple mechanism is employed to connect the movable reflectors with the steering gear on the automobile or other vehicle.



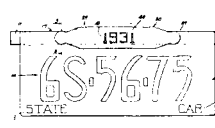
Multiple Flame Welding Nozzle

Patent No. 1947755. Worthy C. Bucknam and George I. Jones. In this new welding nozzle, one form of which is shown in the accompanying drawing, provision is made for gas distributing and fluid cooling passages within and also for controlling the direction of pre-heating and welding flames. In operation, the flames from some of the tips are directed upon the metal to be welded so as to pre-heat it up to or slightly below the point of fusion. Immediately thereafter a flame from another tip fuses the edges of the metal until they flow together and unite. Proper distribution of the gas to the nozzles, and control of the direction of the flame, make it possible to puddle the fused metal properly, yet not burn it or blow it out of the seam being welded.



License Plate Lock Bar

Patent No. 1948554. Harrison Graham Williams. This invention presupposes a change in the conventional system of license plates for vehicles as now used. It provides for a permanent number with a re-issue each year of only a small plate on which the year is stamped. The invention provides for a method of supporting a permanent plate and for locking in position the bar on which appears the year number. The construction of this bar is such that it must be broken in order to be removed and, therefore, a new bar must be obtained before the vehicle may be used.



The above information has been taken from copies of patent specifications. No further details are available except as can be obtained from such specifications.

THE SCIENTIFIC AMERICAN DIGEST

(*Continued from page 320*)

premature babies, who are much less vigorous and therefore more easily affected by changed conditions than normal infants, not only accepted and digested frozen human milk as well as they did fresh human milk but gained approximately as much as babies fed the fresh milk. The age of the frozen milk varied from one to 220 days. In the light of these observations it would apear that a single freezing for a few hours which normally takes place in connection with the delivery of bottle milk would be without effect.—*Health News* (publication of the New York State Department of Health).

Furfural

FURFURAL is not a new chemical but, industrially, it has a story which is new. It was discovered 103 years ago and its name, derived from the word equivalents for bran and oil, is more than 90 years old. It is not made commercially from corn cobs, as some people suppose. By the world's largest manufacturer of rolled oats it is made from oat hulls. Some investigators believe that during the next 50 years furan chemistry will occupy a position analogous to that of benzene chemistry during the past 50 years. Fifteen years ago an order for five pounds could not have been filled within six months. Today 10,000 gallon shipments are of common occurrence. Because of its exceptional solvent power, furfural is used in diversified fields—varnish removers, shoe dyes, textile printing, resin impregnation. In the oil industry it facilitates obtaining extremely high quality lubricating oil, in good yields, from a wide variety of stocks.

Why Vehicles Pass on Right

THE Conestoga wagon, the freight-hauling vehicle of American pioneer days, is responsible for the present custom of vehicles passing on the right in the United States, according to the Bureau of Public Roads. Before the extensive use of the Conestoga wagon it was the custom to pass vehicles to the left, following the earlier English rule.

In England, in the days when men traveled armed on horseback, it was the custom to pass to the left so that the sword or pistol arm would be on the side of the man passed. Later, in travel by coach or wagon, the driver sat on the right side to give his right arm free play in wielding the whip, and passing to the left he was better able to avoid entanglements with the wheels of passing vehicles. Traffic passes to the left to this day in England.

On the Continent—in France, Germany, and Italy—the postillion system of driving, by which the driver sat on the left wheel horse, existed in the early days for both coaches and wagons. To a man riding the left wheel horse passing to the right gives a better view of the passing vehicle. In these countries, passing to the right has always been the custom.

In Italy, until the time of Mussolini,

(*Please turn to page 326*)

THE AMATEUR ASTRONOMER

Conducted by ALBERT G. INGALLS

TELESCOPE making is distinctly not a hobby for small boys, since the worker should have had at least two years in high school, but now and then some bright, enterprising lad crashes through in spite of odds, proving that he has "the stuff" in him, and for such lads there is a welcome. In a letter Russell W. Porter relates how Oscar Marshall, a charter member of the Telescope Makers of Springfield, Vermont, who removed to Pasadena to do fine optical machine work for the California Institute of Technology, ran across one lad who deserved attention and received it.

"The spread of amateur telescope making is a constant source of wonder to me," Mr. Porter writes. "Only last week I spent a delightful afternoon with a prominent movie star in Hollywood, who had made his six-inch telescope and is planning a ten. But the biggest kick came yesterday. Marshall saw a boy over a fence working on something that had the earmarks of a reflector. He stopped his car and came over to the fence.

" 'What you got there, boy?'

" 'Telescope.'

" 'May I have a look?'

" 'Sure, but she doesn't work very good. I can see all right but there are a whole lot of images.'

"Marshall looked down the tube.

" 'Did you make the mirror?'

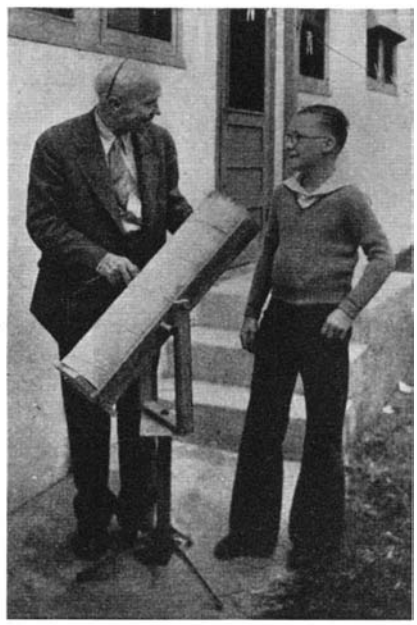
" 'Oh no, it's a shaving mirror I bought at the five-and-ten for 25 cents.'

" 'And the diagonal?'

" 'That's a piece of looking glass.'

"He had taken the eyepiece from a small spyglass, and the whole affair was in a pasteboard tube swung in a wooden fork that rose from the three legs of his mother's Christmas tree stand.

"Well, Marshall put him wise to the extra images and today we went up and photographed this young Richard Cale, aged 13, with his instrument. He had found a looking glass man who had silvered his mirror and ready-made diagonal, and in his hands was a copy of 'Amateur Telescope Making.'



Porter and Cale, Inc.

A look through the eyepiece at some distant clapboards and I could well appreciate the enthusiasm that shone in the boy's eyes.

" 'Now,' he said, 'I'm going to make a real telescope.'

" 'Fine,' I replied, 'and tomorrow after school, come down to Cal. Tech. and I'll show you how we are trying to make a real telescope' (meaning the 200-inch).

" 'Oh gee, will you?' "

So this lad whom Porter took in tow probably saw more about the 200-inch telescope than most of us have seen—which is mighty little more than nothing at all. "I never saw Porter more enthused," Marshall writes, "than when he inspected the lad's enterprise." The photograph was taken by Marshall, who is a sort of amateur professional photographer, or a professional amateur.

CALIFORNIA is still making plenty of telescopes. From the Telescope Class, Franklin High School, Los Angeles, comes the wide photograph reproduced below, and the following comment:

"Los Angeles Public Schools now have a class in telescope making. There are about 40 pupils in the class, which meets at the Franklin Evening High School twice a week. All of the pupils intend to make complete telescopes, although at the present writing most of them are still working on their mirrors, which range in size from four to twelve inches. 'Amateur Telescope Making' is being used as the textbook with great success. Rex W. Beach of Los Angeles is the instructor.

"The class was organized in February under the Federal Emergency Educational Program. A class of this kind constitutes a novel addition to the regular school curriculum and it is hoped that it can be made a permanent thing. A chemistry laboratory room was found to be ideal for making telescope mirrors. Telescope building is a large subject which can offer many worthwhile projects for other classes. For example, a good mounting can be made in either the woodshop class or in the metal-shop class, the mirror can be silvered in the chemistry class, and the mathematical locations of celestial objects can be worked out in the mathematics or astronomy classes."

A METHOD for lining up the optical parts of a Newtonian telescope, suggested by J. V. McAdam of Hastings-on-Hudson, N. Y., runs as follows:

"*A*, *B* and *C* are cardboard disks with ¼″ holes at center, covered with tinfoil having ⅛″ holes at center.

"*D* is a tube 8″ long—cross hairs at one end, head in other end, with 1/32″ hole. Head lined with white cardboard having ⅛″ central hole. Window in side of *D* to illuminate cardboard.

"Remove prism and mirror. Line *C* up

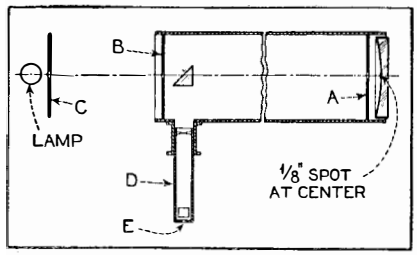
Thirteen men and five ladies at a glass-pushing bee at the Franklin High School in Los Angeles

with *A* and *B* at about center of curvature of mirror, by sighting through *A*.

"Remove *A* and *B* and insert prism, mirror, and *D*.

"Adjust mirror to cast image on *C*, concentric with pinhole. This brings axis of mirror absolutely to axis of tube.

"Adjust prism to bring spot in center of mirror, cross hairs in *D* and image of *E* reflected from face of prism exactly coincident. This brings faces of prism square to mirror axis and ocular axis and insures rays converging on ocular being symmetrical about ocular axis.



McAdam's method of lining up

"All parts should be securely clamped into position to prevent movement during adjustment."

EVERY summer an informal convention of amateur telescope makers is held at the fountainhead of the telescope making hobby, Stellafane, near Springfield, Vermont, and A. D. Baker, Secretary of the Telescope Makers of Springfield, states that this year's meeting will be held on Saturday, July 21. Any reader not already familiar with these annual hob-nob gatherings is advised to throw his telescope into his car, leave his Sunday clothes at home, and come—or to come empty-handed. Don't await an engraved invitation—you won't receive one. An interest in telescopes and in other astronomically minded amateurs will be quite enough. Generally about 200 hobbyists attend these meetings.

BOSTON has organized a club called the Amateur Telescope Makers of Boston. Wagn H. Hargbol of 600 Beech St., Roslindale, Massachusetts, is the president, and Miss Thelma Johnson, 11 Brogan Road, Medford, Massachusetts (who has made a telescope) is the secretary. About 30 attended the first meeting.

Amateurs who would like to discuss clubbing together to have a batch of 16 or 20-inch mirror disks poured, and thus get a lower price if possible, are requested to write, not to us, but to Richard Perkin, 122 Chester Ave., Garden City, New York. If a dozen or so decide on uniform orders it is thought that the price per disk will be greatly reduced. Various workers who have tried to make laminated disks, in order in that way to obtain disks larger than the available stock sizes, have recently reported bad results. The disks seem for a time to hold up, and then slump. Alan R. Kirkham of Tacoma now reports the same experience, and suggests putting a large question mark opposite his note on page 308 of "Amateur Telescope Making." Your scribe takes the blame for the insertion of this note, for it was he who inveigled Kirkham into writing it—partly against the latter's own judgment. In England, however, Messrs. Hindle and Steavenson (see cut, "A.T.M.," page 453) are endeavoring to whip this problem.

THE SCIENTIFIC AMERICAN DIGEST

(*Continued from page* 323)

vehicles in the cities, where postillions were customary, passed to the right; in the country, where box wagons were much used, vehicles passed to the left. Mussolini made passing custom uniform by decreeing that all should pass to the right.

The drivers of the Conestoga wagons rode the left wheel horse. Passing to the right was more convenient in spite of the fact that it was the custom to pass to the left, as in England. Drivers riding the "lazy board" of the Conestoga wagon—a board between the two left-side wheels that pulled out and could be ridden when driving from the side of the wagon—preferred passing traffic to the right.

The deep wagon ruts in the single-track roads made by the Conestoga wagon drivers were followed by other traffic. This explains why vehicles pass to the right in the United States.

Cork Paint

PAINTS containing powdered cork are said to be effective in several novel applications because of cork's natural resistance to rust and corrosion and its insulating value against heat, cold, moisture, and sound. Cork itself is elastic, ductile, and impenetrable to gases and liquids at normal and elevated pressures.

Cork paints, according to *Solvent News*, applied to the under side of automobile hoods are said to protect the finish on the outside from the heat of the motor. On the surfaces of airplane cabins, they are said to provide a certain amount of insulation against motor noise.

In the production of cork paints, dry cork meal is mixed with paints containing pigments such as ochre, chromium, oxide green, and so on, but the mixtures are not ground together. Cork paints may be economically applied only by spraying, pressing, or rolling. Application of a number of thin cork paint films is preferred to a single thick coat.—*A. E. B.*

Radium Dial Painting Still a Hazard

RADIUM dial painting still threatens the health of the workers in the industry, it appears from the report to Congress of Surgeon General Hugh S. Cumming, United States Public Health Service.

The health hazard of this occupation was not entirely eliminated when the habit of pointing the radium paint brushes with the mouth was eliminated, Dr. R. R. Sayers and associates of the federal health service found on investigation during the past year. Their examinations showed that there is a slight accumulation of radium in the bodies of workers who have been employed since January 1, 1927; that is, under present conditions with mouth pointing eliminated. It was this habit of pointing the brushes in the mouth that was held responsible for the tragic deaths by radium poisoning that occurred during the early days of radium watch dial manufacture.

Dust in the air of the workrooms was

found by Dr. Sayers and associates to be radioactive to a degree sufficient to account for the radium accumulation in the bodies of the employees.

The federal health experts recommend that dust in the workrooms should be prevented by extreme cleanliness in the factory, in other words by "good housekeeping." In addition, personal cleanliness of employees and adequate ventilation, both local and general, were urged.—*Science Service.*

Phosphorus Deadly to Waterfowl

PLANS are under way for removing a menace to waterfowl in the large quantities of phosphorus that have been lying on the bottom of waters contiguous to the Aberdeen Proving Ground at the head of Chesapeake Bay in Maryland. The poison menace has resulted in the death of thousands of ducks in the last 10 years, according to Paul G. Redington, Chief of the Bureau of Biological Survey. The canvasback, which is perhaps the most highly prized of all waterfowl and a species that has been reduced seriously in recent years, has suffered from the poison more than other varieties of game birds. Bombing tests conducted by the War Department 10 years ago scattered the deadly chemical under water over 10 or 12 acres of the feeding ground of the birds.

The removal of the phosphorus will be accomplished as a result of dredging operations made necessary in the extension of the air field at the Proving Ground. Announcement of the approval of the project will be a source of gratification to sportsmen and conservationists, as the menace of phosphorus poisoning will now be removed from the waterfowl using this favorite feeding and resting ground. These birds are protected by international treaty, as most of them breed in Canada and winter in the United States.

Something New in Air Conditioning

A NEW air-conditioning system, operating 12 months of the year, in cold weather burns either gas or "coal sticks" wrapped in paper. Each stick weighs about 20 pounds and is 20 inches high and six inches in diameter—not too heavy for a woman or boy to handle.

Inserting the "coal sticks" in the new air-conditioning unit described

The equipment provides complete air conditioning throughout the year. It will heat, humidify, and clean the air in the winter time. It will de-humidify, clean the air, and cool it in the summer time. It is entirely automatic in burning either coal or gas.

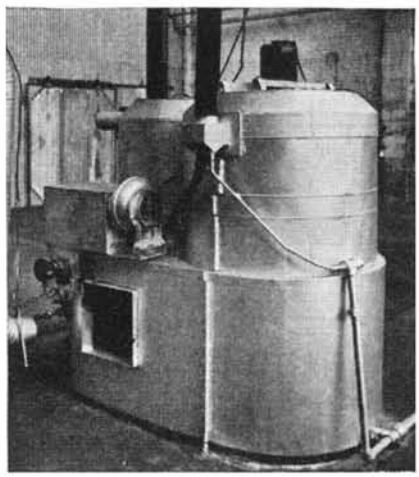
The design of "Conditionedaire," as the equipment is called, is generally rectangular as to base, but rounded on both ends. On one end is a circular heat exchanger that rises above the base. The other end provides a circular magazine rising above the base. This magazine is similar to a revolver with a cylinder containing six chambers. This is enclosed in an air-tight cylinder of Armco sheet iron. A door is provided so that the magazine can be loaded with six sticks of coal. One additional stick is in the fire pot, making a total of seven sticks. These sticks are fed automatically as required into the fire pot, which is about 8 inches in diameter. The coal is burned under forced draught provided by a small combustion blower on the top of the base. The motor which operates the blower is provided with a reduction gear that agitates the grate at sufficient intervals to keep it clear of all ashes and clinkers.

The same motor also turns the magazine around whenever a new stick of coal is necessary. The mechanism to accomplish this is quite simple. As a coal stick is consumed, it drops farther and farther into the furnace. At last it engages a contact which automatically makes an electrical connection that connects the running gears with the magazine and turns it around. When the new stick is brought over the hole where it is fed into the furnace, it disengages the contact.

In the winter time the equipment first cleanses the air. A blower which circulates warm air through the house is of sufficient volume to change the air twice an hour in an eight room house, and the air is cleaned with each operation. Then it is heated up to 200 degrees. Also, it is humidified to the proper comfort zone.

In the humidifier a small jet of heated water is provided in the outgoing hot air flow and this water is broken up and vaporized. Thus the atmosphere is quickly humidified to the proper comfort zone.

In the summer time the same equipment is used to cool and de-humidify the air. As the fan exhausts the warm and humid air from the house, it is blown



Rear view of the air-conditioning equipment; motor is at left center

through and around metal cones which are kept continuously cool by sprays of cool water. The relative humidity is materially reduced which, added to the stirring of air, produces the pleasant comfort zone.

Vitamin D Milk and the Teeth

NO more important contribution to public health has been made in recent years than the development of vitamin D milk, writes Dr. James A. Tobey in a recent issue of *Dental Survey*. Vitamin D milk is particularly valuable as a dietary measure to promote strong well-formed teeth, since it supplies both the calcium and phosphorus needed by the skeletal structure, and the vitamin D which acts to cause these minerals to deposit in the bones and teeth.

The accepted methods for enriching milk in the antirachitic vitamin D are by means of irradiation of the fluid milk with carbon arc lamps, or the feeding of the cattle with irradiated yeast. A pint and a half of milk so treated is equivalent in physiological action to three teaspoons of a standard cod-liver oil, and will prevent and cure rickets in young infants.

Irradiated and pasteurized vitamin D milk and certified vitamin D milk, the latter from yeast-fed cows, are now available in several hundred cities in the United States, including New York, Boston, Philadelphia, Detroit, Milwaukee, and Bridgeport, and these milks are rapidly being introduced in many other communities.

CURRENT BULLETIN BRIEFS

"THERMIT WELDING—INDUSTRY'S MASTER MAINTENANCE TOOL." This new booklet describes the Thermit welding and alumino-thermic process which has been successfully employed for more than 30 years in the welding of heavy sections of ferrous metals. The actual welding of railroad track and the repair of large machine parts, huge machine castings, crankshafts, and similar articles are also covered thoroughly. Particular attention is given to the economy and permanency of the repairs, and actual cost data are given in a number of instances. *Metal and Thermit Corporation, 120 Broadway, N. Y.—Gratis.*

HAYS COMBUSTION RECORDERS. (Catalogue R A-34). This pamphlet deals with combustion meters for carbon dioxide only and for carbon dioxide combined with records of overfire draft and flue gas temperature. The subject is clearly explained in the pamphlet which is of interest to all those who operate boilers. *The Hays Corporation, Michigan City, Ind.—Gratis.*

SCIENCE IN BUYING. *A Series of Eleven Radio Talks.* These broadcasts were mostly by Fellows of the Mellon Institute, and were given by the Kaufman Research Foundation. The broadcasts treated important phases of merchandising. *The Mellon Institute, Pittsburgh, Pa.—Gratis.*

CRYSTALLINE STRUCTURE IN RELATION TO FAILURE OF METALS ESPECIALLY BY FATIGUE, by Dr. H. J. Gough, F.R.S., Super-

intendent of the Engineering Department, National Physical Laboratory, England, who has carried on extensive experimental studies of metallic single crystals. The failure of metals in relation to the crystalline structure forms a subject of mutual interest to the chemist, engineer, metallurgist, and physicist. A considerable portion of the lecture, which in its published form aggregates 110 pages, is devoted to a thorough discussion of failure under repeated cycles of stress or "fatigue" in relation to the crystalline structure. *American Society for Testing Materials, Philadelphia, Pa., 1315 Spruce Street. Price $1.00.*

THE NORTON PULPSTONE withstands the higher grinding pressures of modern paper pulp production. The stone is not solid, but is an assembly of individually made segments bolted to a center. The abrasive is bonded by special clays vitrified at a high temperature in large kilns. The method of assembling and bonding the segments results in a stronger stone than if it were made as a solid mass. The pamphlet describing these stones is furnished by *The Norton Co., Worcester, Mass. —Gratis.*

"NEW MOON" is the name of a magazine published in raised type for the blind. It carries a digest of world news, including political events, as well as bits of humor, household hints, and an occasional short story. This publication is issued at special rates, much below the actual publishing cost. Braille's alphabet was perfected in 1834, and that of Dr. Moon in 1847. Until the Braille Institute of America equipped its printing plant for Moon printing in 1933, books in the Moon type could not be printed in this country, and, as a matter of fact, Braille Institute still remains the only concern in the nation equipped for such printing. For prices address *Braille Institute of America, North Vermont Ave., Los Angeles, Cal.*

ELECTRIC MOTOR LUBRICATION. (*Lubrication*, Vol. XX, No. 3, March, 1934.) Protection of bearings and windings of the electric motor when it is called upon to function in the presence of excessive water, dust, abrasive materials, or acid fumes, has received the most careful attention from motor manufacturing during the past few years. The present pamphlet gives a wealth of practical information on such protection. *The Texas Co., 135 East 42nd St., New York City.—Gratis.*

GRAFTING TREES AND SHRUBS (Circular No. 138), by Dr. H. B. Tukey, describes each step in cleft grafting, whip grafting, bridge grafting, bark and side grafting, and hand grafting, or "budding," as it is generally called. Dr. Tukey explains the special purpose of each type of graft and tells in detail how it is made. *New York State Agricultural Experiment Station, Geneva, N. Y. —Gratis.*

ADOBE OR SUN-DRIED BRICK FOR FARM BUILDINGS. (Farmers' Bulletin 1720-F.) Adobe brick for walls of homes and other buildings is practical in the arid southwest and frequently in humid sections where the climate is favorable for curing the bricks. Bricks can be made by unskilled labor, which makes for low building cost.

Homes made of adobe brick are durable, fire-resistant, and comfortable. The Bulletin gives detailed information as to the manufacture of the brick and laying it in different types of structures. *Superintendent of Documents, Washington, D. C.—5 cents (coin).*

MODERNIZING THE U. S. S. "MISSISSIPPI"

(*Continued from page* 300)

modernized the *Mississippi* he did not forget to improve the many accessories that increase the health and comfort of the officers and men. The galleys (kitchens), the bakeshops, the potato-peelers, and the dish-washing machines were all reconditioned or renewed.

The crew's barber shop was renovated, a new shoe-repairing machine of the latest type installed, and the capacity of the steam laundry was increased. The men's washrooms and lavatories were rearranged and, most important of all, the capacity of the evaporating plant was enlarged so that the daily allowance of fresh water per man could be increased.

The men have a Ship's-Service Store the profits of which go to support their athletic teams, to pay for their ship's movies, and for entertainments such as Christmas parties. Utilizing some of their surplus profits, during modernization they purchased a complete and modern soda fountain and with it, the latest model ice-cream machine that recently, in Cuban waters, was run to capacity in a vain attempt to satisfy that insatiable American craving for ice-cream sodas. At the same time a new talkie machine with all the latest improvements was installed. And finally, in almost every living-compartment of the men was placed a late-model radio!

TO sum up: The modernization of the *Mississippi* thus embraces a substantial addition to her offensive power by increasing the range of her twelve 14-inch guns; it has added to her defensive power by improving the efficiency of her anti-aircraft guns and by increasing her physical resistance to bomb, torpedo, mine, and guns.

By installing new engines and boilers and by increasing her oil bunkers despite her increased displacement, her speed has been maintained and her radius of action greatly increased. By careful designing, the blisters did not radically alter her underwater body, so her maneuvering qualities have been preserved.

Finally, by increasing the convenience and comfort of the crew, the sea-keeping qualities of the ship have been increased, for the efficiency of the ship during a long campaign would depend upon the morale of the men; by demonstrating a sensible concern for the health and comfort of his sailors, Uncle Sam shows not only a big heart but a wise head. These complicated floating fortresses, with their mass of intricate machinery, capable of over 20 knots speed, depend upon the skill, courage, and endurance of the personnel. Without a contented, robust, self-reliant crew, with each member carefully trained for his own particular duties, these mighty battleships, whether modernized or out-moded, are as useless for battle as a "painted ship upon a painted ocean."

Books SELECTED BY THE EDITORS

THE ROBBER BARONS

By Matthew Josephson

J. P. Morgan, John D. Rockefeller, Commodore Vanderbilt, Carnegie, Jim Fisk, Jay Gould, Jim Hill, Harriman and others—these are the "greedy robber barons" who managed, in the last third of the last century to grab most of the natural resources of this great country, sometimes by one means but often by another. This book is a 457-page account of the rise and dealings of these malefactors of great wealth. It is one of the Book-of-the-Month Club selections and deservedly so. The author knows how to tell a story and, by the way, he has not fallen into that too common habit of the slimy muck raker—over-sensationalizing, crusading, tom-tom beating, ranting; the book is quite calm, in fact. But he had no need to, for the mere facts behind his narrative were capable of doing their own smelling.—$3.00 postpaid.—*A. G. I.*

HEARING IN MAN AND ANIMALS

By R. T. Beatty, M.A.B.E., D.Sc.

THOSE who have a loss of hearing and scientific curiosity concerning the sense of hearing in general will find much in this book which will fill out and enlarge their background. It does not concern cures for deafness but is a study of the extant scientific theories of hearing. It is written in plain language and will be understood if the reader has studied high school physics—much of it if he has not. It has 223 pages and 99 figures.—$4.00 postpaid.—*A. G. I.*

ITINERANTS OF THE TIMBER LANDS

By Gray McClintock

THIS is a narrative of the lives of four wolves in Saskatchewan and it contains plenty of action all through—love making, fighting, killing, outwitting. It also contains a vast revelation of the astounding mentality of the wolf. While reading it one lives in the world of the wolf—mainly a world of insistent scents which continually tell the news from everywhere, a very different world from our own. As this tenderfoot reviewer's sole knowledge of wolfology is based on once looking at two forlorn wolves over a city zoo fence, he would value opinions of this book given by readers who happen to live more than "45 minutes from Broadway" and are entitled to an opinion. Do wolves really reason to the extent and depth which this story depicts? The publishers state that the author, a practical naturalist, writes whereof he knows.—$2.15 postpaid.—*A. G. I.*

FOOD, NUTRITION AND HEALTH

By E. V. McCollum and J. Ernestine Becker, Professor, and Associate, Biochemistry, Johns Hopkins University

THIS small book of 144 pages is packed with the most solid, dependable, scientific facts about food and diet and is free from food faddist tendencies.—$1.50 postpaid.—*A. G. I.*

INTRODUCTION TO MODERN PHYSICS

By F. K. Richtmyer, Prof. Phys., Cornell

THIS is the second edition, revised and brought up to date, of a textbook treatise which has earned an established place in the world of science because of its merit. It covers the newer physics alone—that of the present century—and is intended for readers who have completed a study of elementary college physics and can understand calculus, since it is mainly mathematical. It has 728 text pages, 221 illustrations, and is solidly bound. This is the best known book of its kind.—$5.20 postpaid.—*A. G. I.*

THE SCIENTIFIC BASIS OF EVOLUTION

By Thomas Hunt Morgan, Ph.D., D.Sc., LL.D., Prof. Biology, Calif. Inst. Tech.

THE discovery and study of the gene (transmitter of heredity) has removed evolution from a mere observational basis to a definite science, mainly within the last decade. This is the new scientific basis of evolution and the man who, more than any other, has brought about that same change is the author of this book. In it he explains heredity for readers who already know a little biology.—$3.70 postpaid.—*A. G. I.*

THE OLD STONE AGE

By M. C. Burkitt, M.A., F.S.A., F.G.S.

THIS is a general survey of paleolithic times, by a widely recognized anthropologist who is a member of the faculty at Cambridge University. It will become one of the several standard treatises on ancient man which are now available. It covers ancient man's tools, telling how they were made, also much about the geology connected with ancient man and much about the cave art found in Europe. The added space which most treatises devote to the skeletal remains of ancient man is given over by Burkitt to the subject of flint implements, since he is a leading authority on that aspect of paleoanthropology, and the emphasis of the book is in that direction. It has 246 pages and 30 illustrations.—$2.65 postpaid.—*A. G. I.*

COLLEGE PHYSICAL SCIENCE

By Paul McCorkle, Ph.D. and J. Arthur Lewis, M.A.

THIS book contains the subject matter of the "orientation" course in the physical sciences which many colleges nowadays give to first-year students. It is altogether suitable for the general reader, who would gain from it a general elementary background in astronomy (50 pages), geology (53 pages), meteorology (38 pages), chemistry (60 pages) and physics (100 pages)—in short, an all-around survey of the physical sciences. There are 153 illustrations.—$2.15 postpaid.—*A. G. I.*

THE UNITED STATES AND THE CARIBBEAN AREA

By Dana G. Munro

THOSE who are confused regarding historical, political, and diplomatic events in connection wih Cuba, Panama, Dominica, Haiti, and Central America (especially Nicaragua) will find in this 316-page book, written by the professor of Latin American History and Affairs at Princeton University, just the information they want. It brings together from scattered sources the background facts which the well-informed reader will wish to know. Each country is taken up separately and systematically.—$2.15 postpaid.—*A. G. I.*

COMMERCIAL PROPERTY NEWS

Conducted by SYLVESTER J. LIDDY

Sees Danger in Patents on Scientific Discoveries

DANGER in the growing custom of universities patenting for profit scientific discoveries made in their laboratories was recently pointed out by Dr. William H. Howell, Johns Hopkins physiologist and chairman of Science Service executive committee.

This method of taxing the public to support scientific research will result, through its commercial implications, in a decline of laboratory ideals and will alienate public regard for the universities, he said.

Examples of patents on scientific discoveries are those held by the University of Wisconsin through its Alumni Research Foundation on the Steenbock process of adding rickets-preventing vitamin D to certain foods, and by St. Louis University on theelin, the female sex hormone discovered by Dr. E. A. Doisy and associates of the staff of that university.

Dr. Howell sees the patents on scientific discoveries as one factor in a growing tendency to consider research as a business proposition to be controlled through administrative experts.

"When discoveries of practical value are made, they might be patented to protect them from being used by unscrupulous persons," he said, "but the patents should be dedicated to the public by a declaration filed in the patent office."

At present, the profits from such patents are generally turned over to a fund for further research at the university holding the patent.

By the method he proposed Dr. Howell said he believed further scientific work would not be impeded and university research would be maintained on a high plane free from secrecy and commercial temptation.

New Ideas for Railroads

ALTHOUGH earnings of the railroads have been reduced and man power considerably curtailed, indications are that comparatively little recession has taken place as far as new railroad patents are concerned. During the past twelve months over five thousand patents have been issued through the 65 divisions of the Patent Office applicable or relating in some way or another to steam railroad use. . . .

Comfort, speed, and safety for passengers and better and quicker handling of freight are the chief aims of hundreds of inventors, judging from the great number of various types of railroad patents granted each week. Seldom does an issue day pass without the country being more or less richer by one hundred patents of at least some interest to railroad men. Give the railroad public what it wants and then get a patent on it, seems to be the inventor's slogan.

About fifty patents have been taken out during the past two years on improvements in railroad ties, about the same number on tie plates, and over a hundred on rail joints, not to mention those relating to ballast. Although devices to improve track and road-bed construction to insure safety are foremost in the minds of inventors and engineers, each one of the 65 divisions in the Patent Office is utilized by railroad inventors. . . .—*Charles L. Howard, Assistant General Counsel, Western Railroad Association, in* Journal of the Patent Office Society.

Color in Trade Mark

IN *ex parte* Emerson and Stevens Manufacturing Company, Inc., First Assistant Commissioner Spencer held that the company, of Oakland, Maine, is not entitled to register, under the Act of 1905, as a trade mark for scythes, a mark described as a blue-colored coating applied to the blade of the scythe.

In his decision the First Assistant Commissioner stated that the portion of the face of the scythe lying immediately adjacent to the cutting edge and the tip of the blade are free from paint. After noting the holding of the examiner that the paint is deemed to possess merely the utilitarian function of covering all but the cutting edge of the scythe for the purpose of preventing rust and that such a mark does not indicate origin and ownership, the First Assistant Commissioner made the following statements:

"Solid or mass color does not constitute a valid trade mark. Furthermore, the retention of small exposed areas does not avoid the rule of the cases cited. Particularly is this true when, as here, in the ordinary use of the article, the exposed areas will be worn, thereby reducing such areas and increasing the mass of solid color. Eliminating the paint from the cutting edge of the blade is not a fanciful or arbitrary matter but serves a utilitarian purpose in that it permits the prospective purchaser to inspect the cutting edge and likewise facilitates cutting and sharpening. Similarly, the exposed tip will wear in use. The failure to obliterate with color the small area adjacent to the tip does not escape the rule that solid color cannot be exclusively appropriated as a trade mark unless it is applied in a distinctive design such as a star, circle, square, or the like. In the latter case the design does not serve primarily a utilitarian function."

Design Patents Now Issued in Two Weeks

IN accordance with a notice by First Assistant Commissioner Spencer, design patents will now issue more promptly than ever before in the history of the Patent Office. The notice reads as follows:

The Patent Office is now issuing design cases in approximately two weeks after the date of allowance. All cases allowed by the Examiner of Designs on Fridays will be printed and in the issue two weeks from the following Tuesdays.

In order to carry out this program, it is necessary that assignments that are to affect the issue of design patents should be presented to the Patent Office promptly for record, for unless these assignments are in the Assignment Division at the time that the assignment search is made, it will not be possible to put them on the file. In view of the short time elapsing between the allowance and the issuance of these design patents, it is not possible to bring these files back from the Government Printing Office for any purpose whatever.

Beauty Aid Under Ban

MERCHANDISING of face creams, cosmetics, or turtle oil claimed to penetrate and nourish the skin and remove lines or wrinkles, is involved in a Federal Trade Commission case against Worth English, Inc., New York City, cosmetics distributor.

The Commission has ordered this company to cease representing that face creams or cosmetics, or the ingredient, turtle oil, "will penetrate and nourish the skin, remove or reduce lines or wrinkles, build up sagging muscles or underlying flesh, rejuvenate the skin, or build and firm the bust."

Investigation of the contents of the company's products indicated that they do not do all they are represented to do.

Porcelain in Paints

THE Federal Trade Commission has ordered Tuttle's Tite-on Cement Company, Chicago, manufacturer of a cement-like material used as a paint or lacquer in finishing refrigerators and furniture, to discontinue using the words "porcelain" or "porcelain enamel" in the advertisement or sale of its product. In its findings, the Commission said this company's product contained not more than 1 percent of silica and alumina, the main constituents of clay, whereas true porcelain contains large percentages of clay.

Austrian Patents

PATENTS are granted for a term of 18 years from date of advertisement of acceptance of the application.

Patents of addition ("Zusatz-patente") are granted for the unexpired term of the original patent.

Opposition to the grant of a patent may be made within two months after the publication of the application. The opponent may demand costs, and often is granted costs, even if the opposition is not contested.

INDEX TO VOLUME 150, JANUARY-JUNE, 1934

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