

SCIENTIFIC AMERICAN

May
1933

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Is Sexual Abstinence Harmful?

How Biology Answers a Challenge
of Growing Insistence

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THE CASE AGAINST MARGERY

By Walter Franklin Prince

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OUR THIRD-RATE NAVY
COULD NOT FIGHT JAPAN

By F. D. McHugh

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RESEARCH IN TELEPATHY

Volume
148

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SCIENTIFIC AMERICAN

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EIGHTY-NINTH YEAR

ORSON D. MUNN, Editor

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• || An index of articles appearing in back numbers of *Scientific American* is to be found in The Reader's Guide, Industrial Arts Index, Engineering Index, and Dramatic Index. These can be consulted in any large library. || •

ACROSS THE EDITOR'S DESK

REGULAR readers of SCIENTIFIC AMERICAN will note a change in the binding of the present issue. Economies made necessary by decreased revenue, from which every publication is suffering today, have made this temporary change imperative. The content of the issue has, however, been re-arranged and re-allocated so that there is little reduction in the amount of editorial matter. The editor is determined, also, that there shall be no reduction in the quality of the various articles, and he is sure that you will agree that there has been no such reduction after you read this issue. The change in the binding will make little or no difference in binding complete volumes, and readers may rest assured that the former style will be resumed just as soon as business conditions warrant the change.

The urgent need for a Navy built up to allowable treaty strength is discussed from a different and, we hope, an effective angle in the article starting on page 268 of this issue. In presenting this article, we realize that our endeavor to point out the needs of our Navy by specific, detailed, and factual references to Japan may be considered by some as a one-sided criticism of that country. Whether this is so or not, our interest lies primarily in our Navy and not in moot questions of international politics. Nevertheless, in order to make available to our readers both sides of the question, we expect to be able to present in our next issue a brief discussion of the Japanese side of the Manchurian affair, written by a Japanese.

Birth control—the right of individuals to limit reproduction according to their ability to care for children—has been set up by some Christian denominations as a moral problem. As such, birth control has been held to be immune from scientific analysis and from conscious control by the intellect. There are, however, so many aspects of the question that concern not only the individual but also the community, the state, and the nation, that the need for scientific approach is becoming increasingly apparent. SCIENTIFIC AMERICAN therefore requested Dr. C. C. Little, Director of the American Birth Control League, to prepare an article on the subject. He has compacted into the allotted space a most readable discussion that

presents facts in a way that will interest every reader. The article will appear next month.

It appears that the reclamation project that is now underway in Egypt is of greater magnitude and has more ramifications than our first information led us to believe. Our correspondent has just written from Cairo that, after arriving “on location” and looking over some of the details of the job, he finds it impossible to cover them for our next issue as he had expected, and as was announced in this column last month. We shall, however, present the details to our readers as soon as he forwards them to us. In his letter, incidentally, he adds a note that bears directly on the article on page 266 of this issue. He speaks of Egypt as a wonderland for tourists, and dwells particularly on the incomparable cruise through the sapphire blue of the Mediterranean on comfortable American ships, at ridiculously low rates.

Military despotism is a condition that will never be allowed to prevail in this country, but it is a fact that our military establishment should be given more consideration than we are wont to give it. This applies particularly to its functions relative to our civil government in national and international affairs. A better understanding is needed between our military and civil officials. A plea for such coordination, written by Captain W. D. Puleston, one of our contributing editors who is thoroughly familiar with the need for such harmony, will be presented in a forthcoming issue.

The proposed St. Lawrence Waterway project has been subjected to a vast amount of criticism. Just what will be the return to the United States, to shipping interests, and to the electrical power industry for the required investment of hundreds of millions of dollars? We shall publish, in our next number, an article on this important subject, written by an engineer who knows whereof he speaks. And when he speaks, he does not mince words in explaining just how much of a bad bargain this project will be if it goes through.



Editor and Publisher



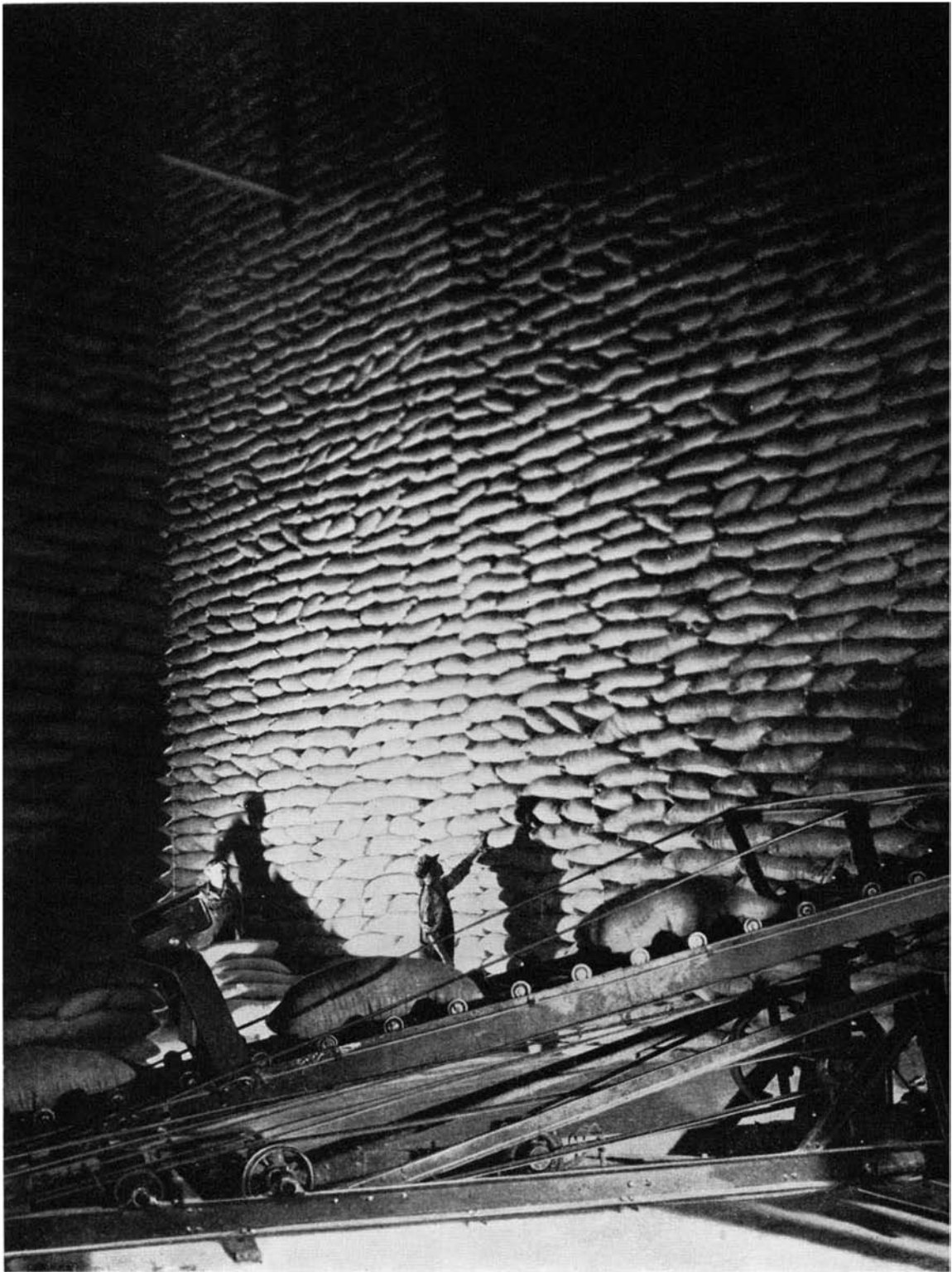
OTELIA AUGSPURGER COMPTON

WESTERN COLLEGE, Oxford, Ohio, has awarded to Mrs. Otelia Compton the honorary degree of Doctor of Laws, because of her achievements. Chief among these achievements are the valuable children she has given to the world. One of her sons is the physicist K. T. Compton, recently made president of the Massachusetts Institute of Technology. Another is the physicist A. H. Compton of the University of Chicago, discoverer of the "Compton effect" in atomic physics, and a Nobel Physics Prize winner. Both are widely known leaders in science.

By thus honorably recognizing the mother of two famous sons, Western College has done an original thing. It is also a scientific thing. While a minority, chiefly among geneticists, might assert that a parent merely passes on from earlier gen-

erations the qualities which occasionally produce individuals of marked ability, and an opposite minority, chiefly among behaviorist psychologists, would lay equally extreme stress on the effects of environment (rearing), most qualified scientists would agree that both are strongly governing factors and recent studies by unbiased biologists bear this out. Thus their verdict would concur with the popular verdict that a large share of the honors we attain should actually be laid in the lap of our parents, particularly our mothers. Mrs. Compton reared her children with care.

She was educated at the institution which now honors her, having earned her way through it piecemeal during a ten-year struggle against adversity. Her husband, Dr. Elias Compton, is a former professor of philosophy at Wooster College.



**BEET SUGAR AWAITING A
FAVORABLE MARKET**

GROWING sugar beets has become one of our big agricultural industries. Sugar beets, gathered in the fields, are brought to the mill where they are processed and the sugar extracted and refined as described in the article on page 280. The finished product is held in bags in the warehouses at the mills to await favorable market requirements before shipping. The bags are mechanically stacked to a great height by an electrically operated endless belt tiercer, which can be moved to any part of the warehouse as needed.



Left: The left hand of (?) the spirit "Walter," supposed to be produced after the manner of a birth, making a right thumb print. Right: the "ectoplasic" hand has become a right one. Note that the right side of Margery's robe in the left illustration is almost flat, while in the one at the right it bulges slightly, although the hand is not supposed to come around the side

THE CASE AGAINST MARGERY

By WALTER FRANKLIN PRINCE

Research Officer, Boston Society for Psychic Research
Ex-President, Society for Psychical Research (London)

THE Margery case of purportedly spiritistic phenomena began in May, 1923, and is, therefore, in its tenth year. It is one of those which were tried out before the SCIENTIFIC AMERICAN Committee, and the last word about it in this magazine was printed in the issue of April, 1925. I will now sketch the subsequent history of the case, but the material is so voluminous and various that only "high spots," summaries, and general characterizations can be presented.

No other American case of "physical phenomena" ever gained such worldwide fame, and none ever so boxed the whole compass of variety or showed such abrupt transitions, dislocations, and inconsistencies. None has had such zealous organized and financial support for the exploitation of its claims for favor as this case has received for eight years from the democratized American Society for Psychical Research. The acme of evidence was reached, 1926-32, in the production, on wax, of a host of thumb prints claiming to be those of a spirit, "Walter."

AS admitted in the last *Proceedings* A.S.P.R. (pp. 367, 384), six groups of investigators have in turn decided adversely. Let us analyze the personnel and their individual decisions.

I. *Harvard Investigation of 1923*: Dr. William McDougall (Harvard psychologist), Dr. A. A. Roback (Harvard psychologist), Dr. Gardner Murphy (psychologist of Columbia), Harry Hel-

ALTHOUGH *Scientific American* is no longer actively engaged in psychic research, the accompanying article is presented because of the wide interest that has always been manifest in the work of the medium Margery. The findings and opinions are those of Dr. Prince and other investigators; it is felt that they should be reported to our readers because, while the affirmative side of this case has been amply laid before the public, the negative side has been inadequately presented.
—The Editor.

son (assistant to Murphy, now director of college psychological laboratory). Three persons besides McDougall (see below), all *contra*; no formal report.

II. *SCIENTIFIC AMERICAN Committee of 1924*: McDougall (psychologist), Comstock (physicist), Prince (psychic researcher), Houdini (magician), Carrington (psychic researcher). Five persons, all but Houdini favorably interested in psychic research, of whom the first four reported *contra*, the last *pro*, although admitting that part of the phenomena might be fraudulent.

III. *McDougall-Worcester, 1924*. See McDougall's verdict in I and II, above. Worcester (clergyman and psychologist) rendered no formal verdict but was finally *contra*.

IV. *Dingwall Investigation, 1924-5*. Dingwall (English psychic researcher) was much impressed for a time by the "effects" shown but his final verdict was "not proved," hence *contra*.

V. *Harvard Group, 1925*: Damon, Hillyer, Marshall, and Code (instructors in English, first two now university professors; last, afterward university instructor), Hoagland (graduate student, now head of university department of biology), Shapley (head of astronomical observatory), Boring (director of psychological laboratory), Wolback (professor of pathology), Day (surgeon), Fawcett (physician). Ten persons, younger members at first impressed, verdict of all decidedly *contra*.

VI. *A.S.P.R. Committee, 1926*: Wood (physicist, Johns Hopkins), Dunlap (psychologist, Johns Hopkins), McComas (psychologist, Princeton). Three persons, first two *contra*, last said to have been *pro*.

Total 23 persons, 21 *contra*, 2 *pro*. Of the two *pro*, one, McComas, became entirely *contra* within a year; the other is at least partially *contra*.

IN December, 1929, the Crandons (Margery and her husband) gave three "demonstrations" in the S.P.R. rooms in London. The Honorary Research Officer, Dr. Woolley, and Mrs. Brackenbury reported in the *Proceedings* that the mechanical control of Margery, understood to be the same as that in Boston, did not prohibit her handling objects on the table, that a

finger print found on a wax there was certainly hers, and that there were definite indications of tampering in connection with another print.

But the story of fatalities is not yet fully summarized. Let us consider the persons who have most actively defended the case in print. Chief of these is J. Malcolm Bird, for five years Research Officer of the A.S.P.R. From his writings has largely come the belief in the case on both sides of the Atlantic. About two years ago, however, he sent in to his employers a long paper claiming the discovery of an act of fraud and reconstructing his view of the case to admit a factor of fraud from the beginning. This paper has not been printed and very few of the believers in Europe or America know of its existence. An amusing feature is that he then held that the phenomena from 1926 on were all genuine, particularly those of the ghost's thumb prints, which are now smashed particularly flat, as described below.

The next most voluminous defender was E. E. Dudley, in whose writings there appears, however, a tinge of reserve. He at length made a discovery which has acted like a bomb, demolishing the very dome of the case and reaching to its basement.

IT is a curious fact that Dr. Crandon's articles have been printed with all the respect due to an independent investigator, whereas he is the exceedingly interested husband of the medium and can scarcely help being at least cognizant of any fraud in the case. The fact is more curious because he is given to statements which are not, to speak politely, historical. On page 86 of "The Case For and Against Psychical Belief" is found his graphic description of trance writing in nine languages, with sheets "shoved violently across at one sitter and another," *all on the same evening*, whereas in Bird's "Margery the Medium," Chapter VII, it had already been shown that these messages in "nine languages" were scattered through at least *seven evenings*.

Dr. Crandon's "Margery-Harvard-Veritas" pamphlet asserts that the notes of the Harvard Group are printed therein "absolutely as written and signed." Actually there were many minor alterations, omissions of many passages of "Walter's" offensive language and excision of more than 1400 words of utmost importance, integrally part of the official notes. Many other instances could be given. Dr. M. W. Richardson, an old friend of Dr. Crandon, two of whose children were supposed to manifest through Margery, wrote several articles in favor. He tes-

tifies to his own scientific accuracy, which accuracy is perhaps illustrated by his printed statement, October 25, 1925, that he had sat in the case "over 300 times," the number being about 135; by his declaration, February 11, 1927, that he had "assisted at about 800 sittings," at which date there had not been as many and he had attended scarcely more than a quarter of the number stated; and by his illusory ac-



Margery



Dr. Crandon

ceptance of a "baby hand" with one too few fingers in a blurred photograph taken, according to Crandon on November 3, according to Bird, November 1, 1924.

Dr. R. J. Tillyard, of New Zealand, wrote confident articles which declare that survival has by "Walter" been "fully proved in a scientific manner," through the production of "his" prints after death. But, as said prints are those of a living man and cannot possibly be those of "Walter," comment is unnecessary. In 1931-2, W. H. Button, President of the A.S.P.R., contributed several enthusiastic articles. Though no doubt an excellent lawyer, his critical faculty may be judged from the fact that in one of his articles he puts confidence in the utterly discredited Zöllner experiments with the faker Slade and, having read W. Whately Smith on the experiments, he failed to discover that Smith condemned them as valueless.

The phenomena produced at the Margery seances switched from one species to another, with occasional unexpected selective relapses, which were unfavorable to continuity of study. Persevering students again and again felt that they needed but to close a little gap to be assured of the supernormality of a species, only to have it halted with the gap still open. For years there has been no "climbing bear," no "psychic pigeon" mysteriously brought in, no reported marvels occurring in some distant part of the house, no perambulating piano stools. Bell box, enchanted scales, voice-machine, baryta-water tests, identification of objects in the dark—space will hardly suffice to name all the members of the series, much less to describe and comment.

Even a particular kind of "ectoplasmic" object appeared in diverse guises. The queer "materialized hand" of late 1924 looks amazingly like one of the plaster casts of early 1924 (see plates in "Margery the Medium"). But the "hand" of the later Dingwall period showed annular bands wonderfully like a trachea, tubular openings and "fingers" with flat edges as though cut with a knife, and Harvard professors of physiology and zoölogy declared that the "ectoplasm" was undoubtedly composed of the lung tissues of some animal. The "hand" of the Harvard Group period was identified as a foot, apparently Margery's. The "Walter" hand shown in the *Journal A.S.P.R.*, October, 1928, making a right thumb print—the hand being a left one and the thumb print that of a living Boston dentist—was undoubtedly of flesh and blood, thrust out from under Margery's draperies.

Professor Wood traced a solid "ectoplasmic" rod, which was performing tricks, *clear up to Margery's mouth*. Analysis of dictated notes shows that before the rod got to work she contrived to transfer the control of her hand to her wrist, and amid her writhings the free fingers could easily get possession of and place the rod. When the man at her right was being tapped on the head she "turned around in her chair and was *apparently over on her right thigh*." Wood, in a letter in my possession, said "It [all his sittings] was the most sordid sort of mediumistic fraud from start to finish . . . cumbered up with a lot of apparatus which served only to give an *appearance* of 'scientific control.'"

THE logic of prohibitions of common-sense measures is as convincing as are damaging observations. Once, for reasons not on the surface, "Walter" ordered me to have a daylight sitting with Margery alone. If the bell which twice (when my attention was momentarily drawn away) gave muffled brief tinkles, really was the one in the box on my knees not four inches from hers, and not one under her clothing, an era had been reached—the bell could be ectoplasmically rung in good white light; and repetition, with one *post facto* search of the medium, would prove this beyond doubt. Doctor Crandon should have rejoiced. But he never would allow another daylight sitting.

Also, a university professor, employed by an organization which withheld from its readers both his report and the fact of his investigation, tried for months to introduce reasonable and obvious measures and all were refused. Why was not *his* bell-box acceptable?

Why was the cumbrous voice-machine, which I myself partly defeated in my only attempt to talk with its plug in my mouth, so cherished and the use of a simple stethoscope, which would have shown whether or not the "independent voice" came from the medium's throat, denied? Why was not a single other sensible request granted, if there was desire to make known and not to conceal the truth?

A marked feature of the case is the certainty and promptitude with which known doubters are excluded from attendance. Even friendly persons who happened to see some puzzling detail (though almost friendly enough to follow the example of the European professor who, after actually seeing the method by which his favorite medium performed her chief trick, said "Isn't it odd that I should have had that hallucination?") have been gradually frozen out. What would be thought of a physicist who, inviting colleagues to witness some new experimental process, should refuse further inspection to those who expressed doubts of its validity?

ANOTHER marked characteristic is the extent to which the world has been called on to feel sympathy for the "martyrs of science." In every interested land it has been chanted that a dreadful and malevolent war against the case has been waged, and that the present writer has been the leader thereof. As near as can be calculated, there have been printed, apart from newspaper stuff, 2639 pages in favor, by upwards of 30 authors; adversely, 216½ pages, by 13 writers. I, in the seven years since I was called upon officially to express myself, have printed 22½ pages, of which 13½ were reprinted. Isn't it awful? One has to

smile, on reading such intimations of his malice and fury, when he remembers the fables which were printed about him in "Margery the Medium," and the 18 false stories to his discredit circulated within a few weeks, following the arrival on our shores of a little stranger and his knightly enlistment in the cause.

The shoe has been quite on the other foot. Opposers and exposers have been painted, almost without exception, as a bad lot. However high in reputation and office, they have been described as prejudiced, malevolent, mendacious, boorish, and stupid. The dyes have been laid on about in proportion to the standing and authority of the intended victim.

In March, 1932, E. E. Dudley discovered that the prints which for six years were being produced as those of the spirit "Walter's" right and left thumbs were actually those of a living Boston dentist. The dentist signed one set of his prints and acknowledged in the presence of several witnesses that he had given his prints to Dudley, but refused to have them taken again, after receiving "advice." The A.S.P.R. refused to print Dudley's paper and proofs, and made a number of venturesome and unwise statements. Thereupon the Boston S.P.R., which had hitherto been silent about the case, printed the Dudley article with its conclusive proofs and utterly refuted the rash assertions of the A.S.P.R. *Journal*, also an article by Carrington augmenting the proof and another by Arthur Goadby, a Trustee of the A.S.P.R. who had hitherto been friendly to the case. The prints of "Walter" are identical with those of the living Dr. "Kerwin" and the chance of mere coincidence is not one in a billion billion.

The A.S.P.R. *Journal* of November

abandoned all its confident misstatements of July, but declared that when the "thorough investigation" of the matter, begun in March, was finished a report would be made. But as "the matter" was solely that of the identity of the "Walter" prints with the dentist's, and as the latter's prints could be retaken, developed and passed on by an expert within half a day, the "thorough investigation" seems languid.

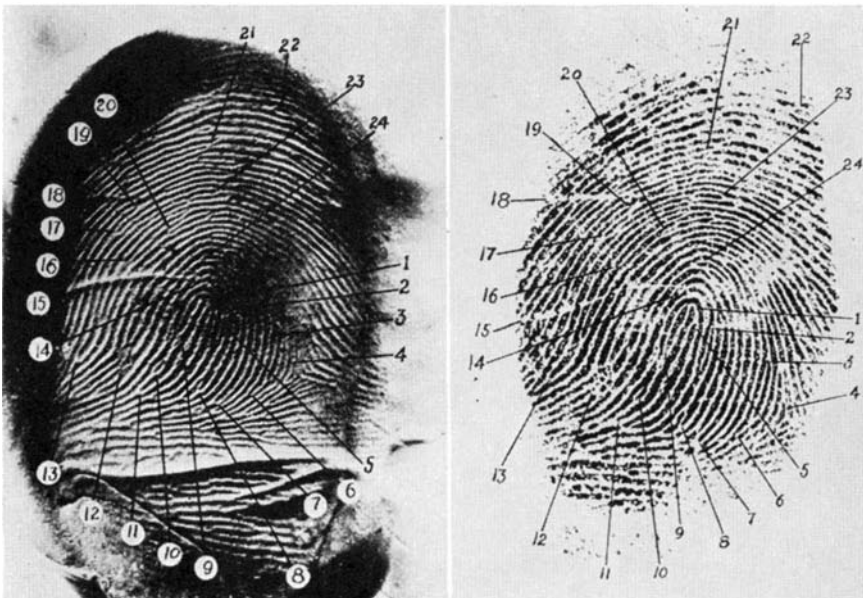
In the meantime, the passage of matter through matter has been "demonstrated." A "Walter" ("Kerwin") print has appeared in a locked box. The padlock seems to have been well guarded but the little screws which hold the hasp, and which can be removed and replaced in the dark within three minutes, seem not to have attracted any attention. Confidence in the tests with pasteboard boxes sealed with sticky tape, so easily removed and replaced, especially as the tapes in several instances showed signs of tampering, is almost incredibly naïve.

Thus has the dome of the whole edifice, the crowning and conclusive phenomenon, crumbled. For six years "Walter" has been claiming another man's prints as his own and explaining how he produces them. This is proved a gigantic fraud. Also, all credit is destroyed in "Walter's" utterances from the beginning.

Some spiritualist organs are trying to save something out of the wreck. At any rate, seeing that the dentist was not present, the conditions were so good (!) and we have been told all along that dies cannot produce all the minutiae of a print from the living finger, must not his prints have been wafted in by an "ideoplastic" process? Odd that it was from the one man who furnished the first wax, pressed his thumbs thereon and left it with Margery that the mysterious effluence emanated! Tell it to the marines! Besides, the "conditions" were never good. *And dies have been made that can produce "thumb" prints which an expert, with the help of a binocular microscope, was not able to distinguish from those of the living finger.*

ALTHOUGH a few earnest and persistent sitters may still believe that, despite the fact that the thumb prints are fraudulent, there remain a few features which are genuine—since they cannot understand how these could normally be produced—it will henceforth be impracticable so to persuade the intelligent reading public, since the impossibility of fraudulent production of the thumb prints has been maintained with as much assurance as the impossibility of anything else.

Fanatics will continue to believe, but for the really thinking body of readers the case has received its death stroke.



The print on the left, in wax, is supposed to be the left thumb print of "Walter." The print at right is that of a living Boston dentist. Compare indexed points

NOTES ON RESEARCH IN TELEPATHY

IN a recent bulletin* of the Boston Society for Psychic Research, Dr. Walter Franklin Prince, Research Officer of the Society, comments at length on the Sinclair experiments for telepathy. (See March, 1932 SCIENTIFIC AMERICAN.) In the introduction to the discussion, several paragraphs are devoted to the physical and mental characteristics of the percipient in the experiments. In a footnote at this point Dr. Prince departs from the discussion to clarify certain phases of telepathic investigation. These comments have such direct bearing on the present SCIENTIFIC AMERICAN investigation of telepathy that we reprint them below:

IF there are those who think there is no value in knowing something of the makeup of the chief witnesses in this case, I emphatically do not agree with them. That such knowledge is not absolutely determinative is, of course, true.

"We are investigating a field of phenomena by all the methods which are practicable. The larger part of the phenomena are sporadic and spontaneous, and can hardly be expected to occur in the laboratory. There are many cases where a man has experienced but one apparition in his lifetime and that at or close to the time when the person imaged died. Will any director of a laboratory consent to keep people under surveillance for a lifetime, to test if such an experience will take place in a laboratory, and can any person be found who will consent so to spend a lifetime? And if, under such conditions, an apparition should be experienced and it should be proved beyond doubt that the person imaged died at that moment, even though the apparitional experience occurred in a laboratory, in no sense would or could *laboratory* tests be applied to it. The authentication of the incident would be the *testimonies* of the scientific gentlemen present, to the effect that the story of the apparition was related to them and written down before the death of the person was known, with, perhaps, details of how the person who experienced the apparition looked and acted at the time. But the testimonies of witnesses outside of the laboratory are evidence of precisely as much weight, *provided that* their mentality and reputation for veracity are equal.

"With favorable subjects, experi-

ments for telepathy can sometimes be and sometimes have been carried on with all the rigidity of method and the scrupulosity of a laboratory, or, if there remain doubts and objections on grounds seemingly almost of as 'occult' a nature as telepathy itself, doubtless in time to come methods will be devised to meet these doubts and objections, but subjects of singularly calm and poised nature will be required. It seems to be a fact with which we have to deal,

REPORTS of results in our first test for telepathy (March 1933 issue) are still coming in, but we cannot analyze the results until readers all over the world have had a chance to send in their charts. A complete report will be made as soon as possible.—*The Editor.*

however regrettable, that with most persons who under friendly and unstrained conditions at times strongly evidence telepathic powers, suddenly to place them in a room containing strange apparatus, and before a committee of strangers—some perhaps cold and stern in appearance, others whose amiable demeanor nevertheless betrays an amused skepticism—is to make it improbable that they can exhibit telepathy at all. It will have to be recognized as a scientific datum that a state of mental tranquillity and passivity is generally requisite for such manifestations. Nor is this peculiar to psychical manifestations; the principle applies more or less to a variety of psychological manifestations and powers. Mark Twain could reel off witty utterances when he was mentally at ease, but had he been surrounded by a solemn-visaged group of psychologists with his wrists harnessed to a sphygmometer, and placed in face of an apparatus for recording graphs and a stenographer with poised pencil, it is very certain that his reactions would not have been those of brilliant and original humor. . . .

"In this laboratory-fixation age it is well to remember that certain even of the physical sciences quite or mostly elude laboratory experimentation. Take, for example, astronomy, a great and promising but difficult and problematical field of research. No sun of all the millions, no planet, no planetary satellite, no comet, no tiniest of the asteroids can be brought into a laboratory. Once in a while a meteoric stone reaches the earth, and this can be ana-

lyzed, but no laboratory can control or predict the time or place of its falling. It is necessary to devise agencies—telescopes, spectroscopes, and so on—which in a sense go out and bring back data about the subjects of this science, and to develop methods of mathematical deduction by which to reach conclusions which are accepted by most people on authority only, since to most people the mathematics is quite unintelligible. . . .

"But in spite of all the shifting and reconstruction of theories, the assertions and counter-assertions, the complexity and enormous difficulty of its numerous problems, and the exceedingly subtle methods by which, in a great measure, these problems must be studied, no one is so foolish as to think that astronomical investigation should not be pursued.

TO a very large extent psychic research is analogous with astronomy. It, the youngest of the sciences (by few as yet acknowledged to be a science), has a very difficult field, lying as far apart from the ordinary life of most men as the multitudinous realities of infinite space lie outside the range of thought of ordinary men; its problems are many, theories are shifting and contradictory, certain facts are both affirmed and denied, and, what is more to the point for our present purpose, only to a limited extent can its problems be taken into the laboratory, but for the most part, techniques and logical methods have to be devised to fit the nature of the facts with which we deal. In astronomy, most of the subjects of study can be found in place at any time; the great drawback is that they are so fearfully distant as to be sensed very slightly. On the other hand, with certain exceptions, either of kind or degree, the subjects of psychical study cannot be found in place whenever wanted but appear occasionally, yet when they do appear often do so with a nearness and clearness which spares the witnesses the necessity of those cautious qualifying phrases so common in articles dealing with astronomy.

"In order at length to turn the attention of scientific men to a quarter of reality to which most of them are now voluntarily blind, we must continue to do what some people condemn as 'old stuff', and that is to multiply the number of *intelligent* and *reputable* witnesses by teaching people how to observe and how to report, and by ridding them of the cowardice which now keeps at least five out of six potential witnesses of such standing silent."

*Bulletin XVI, "The Sinclair Experiments Demonstrating Telepathy," obtainable for a nominal sum from Boston Society for Psychic Research, 719 Boylston Street, Boston, Massachusetts.

OUR POINT OF VIEW

Primitive Barter for Moderns

PERHAPS more discussions of finance and economics have assailed the eye and ear of the people these last lean years than ever before in the history of the country. It is probable, too, that the average person now knows more of the mysterious inner workings of economic laws; he is talking it over with the butcher, the baker, the candle-stick maker, and they all answer in kind. What few of them—these average ones—can grasp but slightly is the meaning of our widespread destitution in the midst of plenty. Even the doctors disagree on this point.

There seems, however, one universally acknowledged cure for the troubles that beset us, and that is: WORK. The millions who are eager for work—for any kind of work that would supply them with the necessities of life—and the holders of the locked horn of plenty who would gladly supply the needed products in return for services needed by them, are all equally desirous of finding the key to the situation. Money has failed. It has proved inadequate to the task for although plenty of currency is in circulation, it has been moving too slowly to afford the necessary purchasing power.

Barter, a scheme as old as man himself, has stepped into the breach. Starting slowly between individuals here and there, this old-new system of exchanging products for work or services of various kinds has grown rapidly during the past year or more so that now it is estimated that fully a million people in a dozen states are benefiting from it. Barter has proved the obvious fact that money is not a necessity of trade.

With the growth of the system, barter exchanges were inevitable. These have been organized in many states as clearing houses for labor and goods. Scrip, with which we are now familiar, has been issued by many of these exchanges to provide for a proper distribution and permit satisfying the need for a variety of goods. For farm labor and even for professional services, farmers are exchanging with individuals and through clearing houses, tons of farm products. Carpenters are doing jobs for food or for scrip with which to buy it from the clearing house stores. Barbers cut hair for dental or medical services. Practically any kind of work is exchanged for food, clothing, furniture, rent, and the like.

Work—not of the “made” kind but

necessary work—is thus making many thousands of people happy again and giving them hope for the future. Value given for value received is proving more potent than money. The question now arises: Can the barter idea be applied to great industries which have felt the limitations of slow-moving currency? Economists are studying the problem from this angle and it is possible that the benefits of barter may soon be felt in this direction. One large-scale example in New York, of which we’ve heard, gives an indication of what might be accomplished. An exporter is exchanging directly large quantities of otherwise unsalable cotton—of which this country has a surplus—for large quantities of otherwise unsalable coffee—of which Brazil has a surplus; and no money or money credits complicate the transactions.

A professor of economics at Princeton University, Frank D. Graham, has laid out in his recent book, “The Abolition of Unemployment,” what appears to be the most scientific scheme for barter on a large scale that anyone has worked out so far. After discussing the background of the problem, Professor Graham builds an organization of business men that would be national in scope and which, in theory at least, would put millions of people to work. The Emergency Employment Corporation, as he dubs this organization, would be a monster clearing house for labor of all kinds, skilled and unskilled, for professional services, for farm and factory products, in fact for practically every human need. It would operate on the basis of automatic adjustment between wages and output so that all need for money or the possibility of losses would be eliminated. He also cites the obvious objections that may be made to his scheme and gives his rejoinders.

The average man may have learned a lot about economics during these troublous times, but he is going to learn much more before evil conditions are corrected. It may yet come to barter for the millions, the operation of the fundamental law of supply and demand. The evidence points this way more than ever in view of the growth of the barter exchanges and the publication of such books as that of Professor Graham. To that same average man who has lived from hand to mouth for many months, this fact is of vital importance for it may mean for him a job, and food and clothes for his family.

Radium

FOR a long time Belgium has held a virtual monopoly in radium, through control of the Katanga mines in the Belgian Congo. Now rich ore has been found in Canada and Canadian radium is about to go on the market. What will be the effect?

The Canadian find was made in May, 1930, by a prospector who observed a peculiar rock formation while flying near the shore of Great Bear Lake, near the Arctic Sea and Arctic Circle. He later reached the same region on foot and found a vein of pitchblende which proved to be rich in radium. Forty tons of ore have now been brought out by airplane from this otherwise inaccessible region and the Canadian Department of Mines, with the University of Toronto, and with the help of M. L. Pochon who was once associated with the Curies, has set up a reduction plant near Toronto. These workers have greatly improved the reduction process and cheapened it.

It therefore seems certain that the price of radium will go down. Why has it been up?

Radium prices have been sky-high largely because they have been held sky-high by the Belgian radium monopoly—just as diamond prices are held far above the prices at which the law of supply and demand would normally set them if it were not for the very deliberate curtailment of production made by the diamond interests. This is legal and harmless in the case of diamonds, and it is also legal to curtail the production of radium. But is it harmless?

The medical world lacks sufficient radium to treat more than a portion of the cancer sufferers who need radium treatment. It is precisely accurate to state that people are dying of cancer *now* who could live if it were not for the radium monopoly.

Readers who are old enough to remember the events of 1914 and 1915 will recall that there was a great wave of worldwide sympathy for Belgium at that time. The writer of these comments recalls sending his winter overcoat and a barrel of flour (accompanied, it is confessed, by some sentimentalism and tears) to the Belgian people. Later his own mother died of cancer in circumstances which could have been different had radium been more easily available.

Few will weep over the threatened predicament of the Belgian radium monopoly.

TRAVEL TODAY AT BARGAIN RATES

THE time to travel is here—now. It is a time most propitious in all essentials. Any type of journey or tour may be easily arranged; the costs were never so low and comfort is assured in advance. Travel had been geared up to such a pace before 1929 that the various organizations involved must carry on. The ships are there, the trains are there, and other means of conveyance are also ready for your use. Choose your own point of interest; there never was such an embarrassment of riches as regards places to go. Your travel dollar will now go farther than ever before and present-day comfort of travel would have sounded like a “tall story” even ten years ago. The world is at your feet and the only thing for you to do is to make up your mind where to go.

Possibly your inclination may be for near-by mountains or seashore, the Great Lakes, or our western wonderland. Possibly you would like to cruise to the Spanish Main or you may want to see what millions of others have enjoyed in lands over the seas.

TO the steamer and train may be added the choice of travel by bus and air. Combinations of all modes of travel are not at all unusual. The person of average means need not be deterred by costs, for these have decreased 25 to 50 percent in the last three years. Do not hesitate to inquire about what is doing in the travel world, but do not wait until first and best

choice has been secured by someone else.

The tourist agencies, steamship companies, and other travel bureaus have trained experts who are ready and willing to help you. Strange to say, this is one business where the services are ren-

dered to you free of cost; any transportation company or hotel is glad to recompense those who obtain business for them. The literature available for the asking is most helpful and the vol-

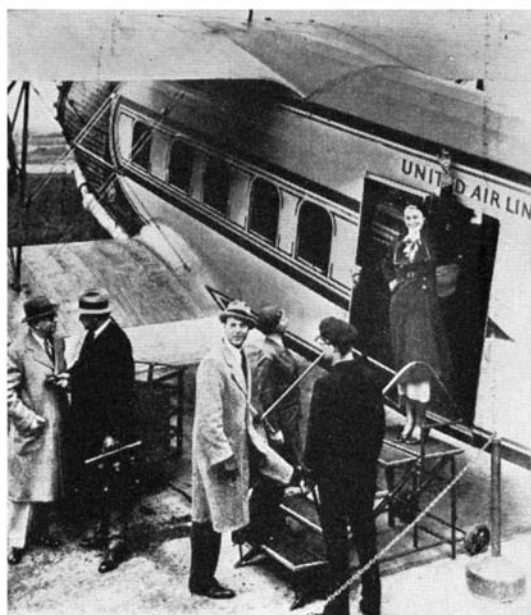
year you will find marine “cruises” available. They are not only good fun but are broadening as well. These cruises are usually very economical, even though large, world-famous steamers are employed. A cruise may be arranged for a week-end, for a three-weeks trip or for a circuit of the world. The cost rarely exceeds ten dollars a day and is often less. The amusements provided would make the traveler of even a decade ago dizzy. There are dances, bridge, moving pictures, vaudeville, night clubs (perfectly respectable, certainly, and with no chance of a raid), and swimming pools. There are, of course, the usual

By A. A. HOPKINS

Editor *Scientific American Handbook of Travel*



Centrally located offices in large cities afford ample facilities for taking care of passengers' needs as to information, sale of tickets, and baggage checking



Typical scene at airport of mid-continent airway. Passengers boarding a trimotor airplane

ume procurable is enormous. The railroads of some foreign countries issue booklets which are almost guide books. Our own railroads have much travel literature besides the time-honored but still useful folder. Write any general passenger agent and see what he will send you!

Hotel rates all over the world are being reduced. Soon every hotel room in Europe will have its own private bath; they are 60 percent on the way now. Think of a private bath in, let us say, Jerusalem! Food has decreased in price everywhere and you can eat and drink economically almost everywhere if you eschew night clubs, which are a “racket” the world over.

At almost all times of the

deck games, unlimited food, and an “unrestricted” smoking room which is unlimbered for real action beyond the three-mile limit. Then there are the delicious snacks for late supper prepared by special chefs. It is difficult to paint a picture which is as alluring as the reality.

These cruises, even though lengthy, often make only ports where passports are not required. If you go to Europe or South America you will, of course, have to obtain a passport but your travel agency will relieve you of much of the drudgery. Tourists who visit our insular possessions do not even have to submit to a customs examination.

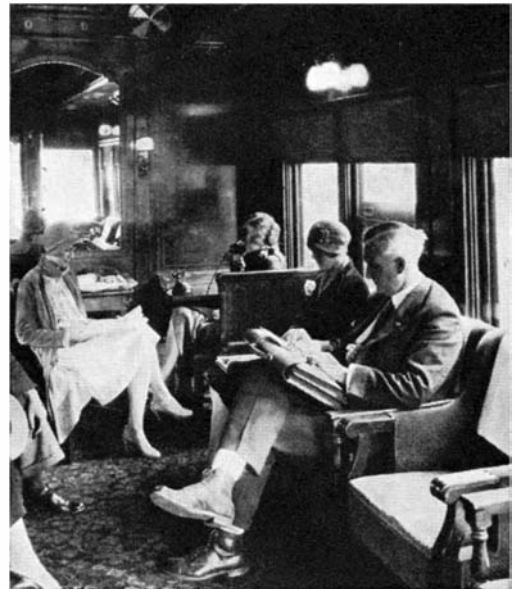
Railroads are making a great effort to meet the travel needs of thrifty people. It is possible to secure week-end excursions at a 45 percent reduction at all times of the year. Round trip and circular tour tickets are available with such liberal stop-off privileges that you may visit many interesting places

en route. Sometime when you are planning a trip to a definite destination look through your time-table and see if there is some place you would like to visit on the way to your main objective. You will usually find that this can be arranged at no extra cost. For example, you can go from the east to the World's Fair at Chicago next June by one road and return by another—see both Washington and Niagara Falls on the way!

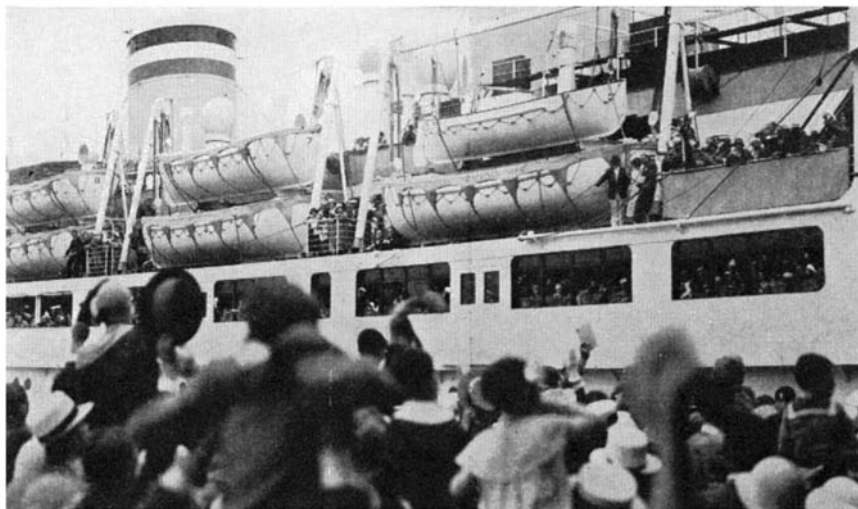
RAILROADS have done much to improve travel and lower rates; progress in this direction is destined to be accelerated in the near future. Most of the excess fare on trains has been done away with except on a few trains for those whose time is in reality money. The no-excess-fare trains are fast enough for anyone traveling for pleasure. Dining cars are more moderate in their charges than of yore. Pullman fares have been decreased and that step-

of Greece, Italy, and Gibraltar. Why not a trip around the world? We shall not quote many prices, but a few are important: you can go around the world from any part of the United States (your local station back to your local station) in 105 days at a total expense of 749 dollars. This figures out to \$7.10 a day. What does it cost you to live at home now?

Trips to Europe are in a class by themselves and costs range from almost nothing up to thousands of dollars for luxurious suites. Consider, for example, one "thrifty" tour. You can go to Europe and be gone 14 days for 189 dollars. Furthermore, you will travel on one of the two fastest ships in the world. There are various



Observation-library-lounge which, with the diner, takes away the tedium of rail travel



This motorship is leaving New York City for a transatlantic voyage. Every visible deck is crowded with pleasure seekers who are bound for various foreign lands

child of the war, the surcharge or "overcharge"—as we ought to call it—will probably soon be a thing of the past; the skids are under it now.

If you wish to go North, there are the Great Lakes, the St. Lawrence, and dozens of other places all easily reached at low rates. The middle-west has interesting rivers served by "stern wheelers," and California and near-by states fairly bristle with interesting spots to visit.

THEN there is always the up-standing Northwest with Alaska as the northern limit of our great series of playgrounds. The Canadian Rockies and western Canada in general offer some of the loveliest spots in the world, all easily accessible.

Beyond our west coast is languorous Hawaii and the somnolent East where sleep age-old cultures, mysticism, and romance. There is Java and Indo-China, India itself, and finally Egypt and the Holy Land. Then you can return by way

kinds of educational tours and college tours, and every purse can be accommodated. Tourist class is now much sought after and has edged the second class off all ships with the exception of those of two lines. This class has even taken over some of the first-class accommodations on one of our larger steamers. Third class is clean, economical, and the food is good.

A new mode of individual travel in Europe costs only about eight dollars a day. Your tickets include local steamship and rail transportation, hotel accommodations, taxes, sightseeing, transfer from station or pier, and fees to hotel servants on the Continent. Full itineraries put everything in black and white. A similar service exists for extended travel in the United States and Canada.

The traveler's baggage bogey is no more. Bags and trunks can be checked from your home to any hotel in the United States at trifling cost. Your bag-

gage can be sent to the pier, if you are traveling by steamer, thus doing away with a stop at a hotel. If you want to make a rail stop-over, you can send your heavy baggage on to your ultimate destination; the charge for storage is negligible. European tourists often eschew trunks entirely and use suitcases which are not too large to fit in the racks in the cars. Even if you travel "tourist" on board ship, your trunk will be put in a baggage room where you can have daily access to it.

THE airplane affords a speedy means of transport and the business of air travel has become less complicated than in the earlier days. Now a taxi comes to your hotel and takes you to the transportation office. From here luxurious buses whisk you away to the airport and soon you are in a comfortable airplane where a hostess makes you at home. On extended trips, well-trained stewards serve delicious meals.

Buses seem to fill a particular need, in the west especially, for long distance travel. Many of them are equipped for all-night travel and often meals are served en route. Buses of this type have left less imprint in the east.

While tourist agencies and transportation companies are recommended for detailed information as to dates, costs, and so on, there may be many of our readers who would like to have general facts on aspects of travel not treated in this article. Letters requesting such information, addressed to the author in care of this magazine, will receive prompt attention. The writer has followed the trend of travel for the last 40 years and has been of material assistance to many travelers. Nothing but advice can be given as we do not want to encroach on the business of those who give travel service so efficiently.

OUR THIRD-RATE NAVY COULD NOT FIGHT JAPAN

AMERICA does not want war with Japan. *We want to emphasize that fact.* The Japanese people may mistrust our motives; they may believe that we have plans for aggrandizement in the Orient, that others, also, might threaten Japan's very existence by an apportionment of the lands surrounding her island empire. We have no such plans. We want no territory in Asia, and we wish to prevent, by peaceful means, any further penetration of that great continent by any other nation. The sooner the great and admirable people of Japan realize that fact, the sooner will the terrible threat of war between us be swept away and the United States and Japan can, together, work for peace and our mutual interests in the Pacific.

That terrible threat now sorely troubles the world, for a War Party is in control in Japan. The Japanese people as a whole bitterly oppose it but because of their impotence that fact lessens the danger but slightly. We feel, therefore, that it is time to cease beating the wind and to present outright the facts as

they stand to show the bearing the present aggressive policy of Japan's War Party has upon our Naval strength. In the past, some of our many articles stressing the need for an adequate navy have been perhaps too academic; the accompanying article is written, therefore, if not "in words of two syllables," at least in plain understandable language. Homeopathic doses having failed to aid the patient, an allopathic dose is given; our naval weakness must be remedied somehow.

To the Japanese people, **SCIENTIFIC AMERICAN** addresses a plea for a better understanding not only of our national aim to preserve peace throughout the world but also of the necessity of condemning, as they themselves do, the War Party which is in control. Since this War Party is the government of Japan, it must be recognized that any and all references to that country in this article are directed at the War Party, and that these references do not in any way reflect upon the Japanese people whom we hold in great esteem.—*The Editor.*

By F. D. McHUGH

JAPAN'S War Party, powerful and supreme in Japan, challenges the world. By its activities since September, 1931, it has not only endangered international good will and friendships but has threatened the peace of the world as nothing else has done since the World War. With the assurance that other nations are too disturbed with internal troubles—most of which arise from the depression—to take steps against Japan even if they desired to do so, this mighty party has carried the flag of Japan into the north-eastern provinces of China, has practically annexed much territory, and has defied the nations of the world both in and out of the League of Nations.

It should not be necessary to explain the connection between the aims of the Japanese militarists on the one hand and our Navy on the other, but it so happens that there are in this country many idealists whose vision in respect to the danger of war is myopic. These people believe altruistic gestures more important than a show of power to preserve peace throughout the world; that an emotional desire for peace assures it in perpetuity; that disarmament, by agreement, will make future international combats impossible by rendering nations incapable of waging wars. The wish of these people is father to their opinion that wars *are* a thing of the past.

It must, therefore, be explained that,

in the opinion of competent observers, the United States was on the verge of war with Japan last year! It so happened that our fleet was concentrated in the Pacific for maneuvers early in January, 1932, or, according to widely expressed opinion, the Japanese would never have retired from the shambles of Shanghai, and war with Japan might not have been avoided. As it was, at one time during the Japanese offensive at Shanghai, Japan came so near declaring war on the United States that it seemed but a matter of hours until the fateful declaration would be made. Since that time the information has leaked out through several reliable sources that our government had issued orders to our military services to "stand by for mobilization"! To arrive at the reason for this, it is necessary to look backward a bit and see how we are concerned in the policies of Asia and the Pacific; how, during the present Japanese excursion into China, international efforts for peaceful conciliation have failed miserably; and how Japan has repudiated important treaties.

TWO of these treaties—the Nine-Power Treaty which guaranteed the territorial and administrative integrity of China, and the Pact of Paris—meant a few years ago a great deal to the theoretical permanent peace of the world. When these were signed, the nations of the world had faith in Japan's

good intentions. Both were primarily the product of American idealism and were considered important steps toward perpetual peace. Japan had been accepted into the family of civilized nations not so many years before as an admired, progressive, and enlightened brother and, since that acceptance, has been accorded all rights and privileges to which that station entitled her. She joined the League of Nations and here, too, her sincerity was not questioned.

What has happened? Japan has taken a huge slice of another country at a terrific cost in lives and property, defied the League, and shocked the world generally by her war-like attitude. Marching arrogantly into the Manchurian provinces of China, she took, in 1931, absolute charge of three of them which she claims have *voluntarily* declared themselves independent of China as the state of "Manchukuo" but which she actually rules through *advisers* and will surely absorb as she did Korea some years ago—unless something unforeseen happens. Last year she attempted to strike at the heart of China through Shanghai, and already this year has taken another important port, Shanhaikwan. She has just extended her war of conquest into Jehol and conquered it so that this fourth province of old Manchuria can "of its own free will and accord" declare itself free from China proper. Japanese militarists say that Jehol is

a part of "Manchukuo," which they further claim is not an integral part of China despite the fact that Japan fought Russia in 1904 to prove that it was.

What is behind it all? Japan feels that she had provocation. She claims her warfare in China, with its ghastly toll in lives and property, was necessary to protect her investments and enterprises against the war lords. She says she had to stop the sporadic civil wars that threatened her interests. She says, further, that she had to have a buffer against Soviet Russia, against Bolshevism. Having had a taste, early in the century, of Imperial Russia's desire to dominate Asia, Japan knows that Soviet Russia is even greedier. One thing more: Since Japan is one of the most densely populated countries of the world and her nationals are excluded from most of the countries to which they would be drawn as immigrants, she actually needs some outlet for her surplus population, or a national birth-control policy.

Suppose Japan did have legitimate grounds for complaint against China? Both these countries were members of the League of Nations (Japan has recently withdrawn) and both signed the Kellogg Peace Pact. Japan was, therefore, committed to the council chamber method of smoothing out difficulties. Why did she not lay her grievances before the nations of the world—nations that had accepted her as one of them and would have been as sympathetic as the facts warranted? This the militarists did not do. They took matters

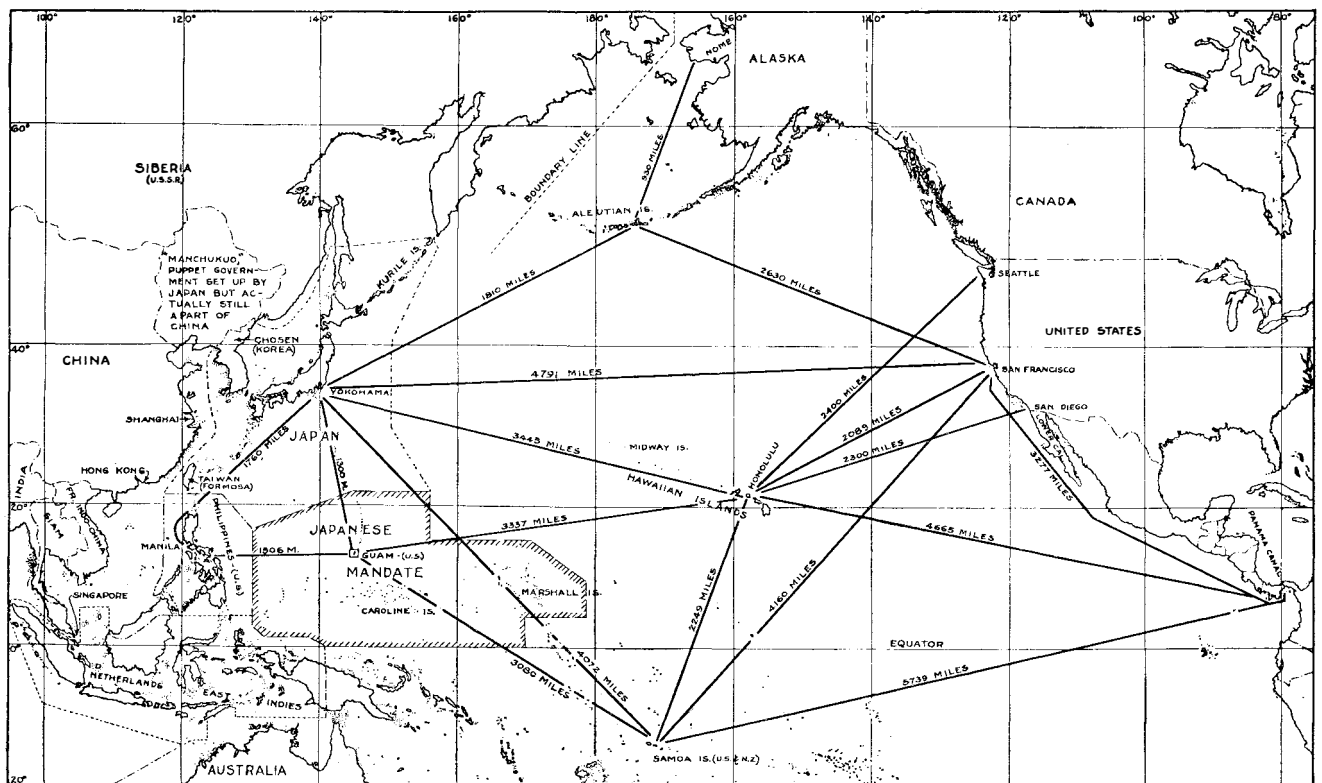
into their own hands in September, 1931, and marched into Manchuria, claiming as immediate provocation the destruction of about a four-foot section of the main line of the Japanese-owned South Manchurian Railway.

AS a matter of fact, Japan's immediate provocation was and is still to be found within her own Empire. Revolutionary movements of several kinds: Communist, Fascist, and Nationalist—the praiseworthy desire of the people to set up a government of their own—have kept her in a turmoil for years. To quiet these and prevent a revolution, Japan simply heeded the old maxim that to unify dissenting elements of a nation there is no more powerful means than that of starting a patriotic foreign war. Further, Japan is and always has been an opportunist as western nations have been in the past. In 1915 when Europe was at war and China, therefore, was helpless, Japan attempted to force upon China the Twenty-One Demands which would have made of the latter a vassal state. Japanese statesmen at the time said that this was "the opportunity of a century." Seeing now the deplorably weak condition of other interested nations, due to the world-wide depression, she knew that nothing but diplomatic notes would result from any action that she might take. So far, this turns out to be the case, although she was censured by the Lytton Report and her Manchurian adventure has recently been condemned by the League of Nations as wholly unjustifiable. (Unable to have its way entirely, the military

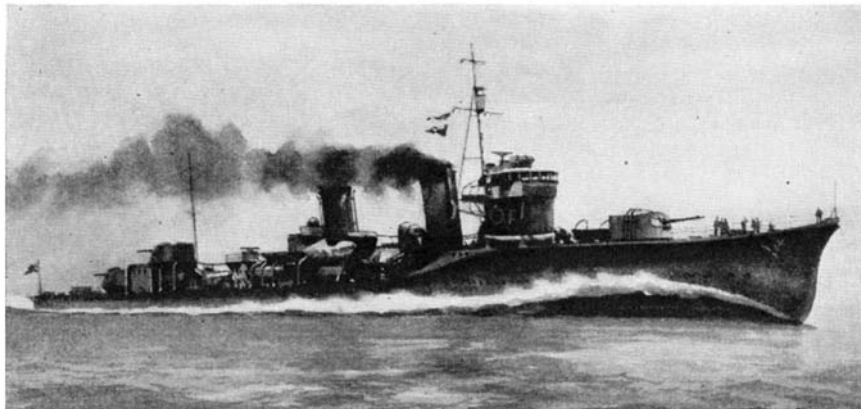
government has answered this condemnation by resignation from the League.)

The problem goes much further back than this, however, to the question of trade and commerce. Civilization follows trade. Progress and culture have throughout the ages followed the caravans and ships of traders, the interchange of raw and manufactured products, and the many wars that have been fought to gain the right to a free interchange of products or, sometimes, to gain preferential treatment. In this, a nation's navy is vitally concerned. The navy is not, as some people will contend, a weapon with which to win battles in war but primarily a peacetime tool which, to the extent that it is manifestly powerful enough to command respect for the international policies of a nation, assures to that nation the right to trade peaceably with all peoples. It so happens in our case that prosperity depends largely on the margin of profit allowed us by our foreign trade.

The interest of the United States in the Far East dates back to 1833 when we made a commercial treaty with Siam, not for a selfish motive but simply to be put on an equal footing with other nations. Then early in the Forties, our Navy, by a show of force, opened up China to the trade of this country by obtaining trade concessions for us at a time when the British were seeking special privileges. Our "Open Door Doctrine" which proposed equal opportunity for all and preference for none, grew out of this initial service to the China trade by our Navy. In



Where Japanese aggression threatens our interests in the Pacific. Our trade in this area is poorly protected



Drawing of the Japanese destroyer *Fubuki*. Japan has built many new vessels in this class since the World War and possesses 24 powerful flotilla leaders

1853-54, our Navy again served the trade interests of the western nations by opening up Japan. Our Civil War intervened and, following this, we were so busy developing our west that we neglected the Pacific entirely until we acquired the Philippines in 1898. During this time, Great Britain, France, and Russia, ignoring our Open Door Doctrine, bitterly fought for special privileges in China. In 1894, Japan won its first modern war with China. This Japanese victory stimulated the efforts of European powers to dismember China, the last great "backward" independent section of the world.

WHEN the Philippines fell to us after the Spanish-American War, the British, finding themselves forced to divide their attention because of developments elsewhere in the Empire and yet desiring to maintain the balance of power in the Orient, undertook to awaken our interest in the Pacific and Asia. We obtained, in 1900, agreement of the interested European powers and of Japan to our old Open Door Doctrine. Despite this supposed elimination of preferential opportunities, the Anglo-Japanese Alliance was formed in 1902, and the Russo-Japanese War was the result. This war was a flagrant violation of our Open Door Doctrine but to this fact we closed our eyes as we did when Japan later absorbed Korea. We were content to forward diplomatic notes of protest in these cases but were not even disturbed to this extent when Japan took Formosa on the south and the Kurile Islands on the north to Kamchatka, thus completing her insular barrier to the continent of Asia.

These extensions of territory were made in furtherance of Japan's aggressive Maritime and Territorial Plans which, according to authorities, have been purposefully developed over a long period of years by War Party strategists. The former plan contemplates the ultimate domination by Japan of all the islands in the Pacific north of the Equator, including the Philippines—an American possession.

William Howard Gardiner, President of the Navy League of the United States, is authority for the statement that about 1914, there hung in the Tokyo Museum a map showing "all of these islands" (above the Equator) "—and even Lower California—as within the prospective Japanese realm."

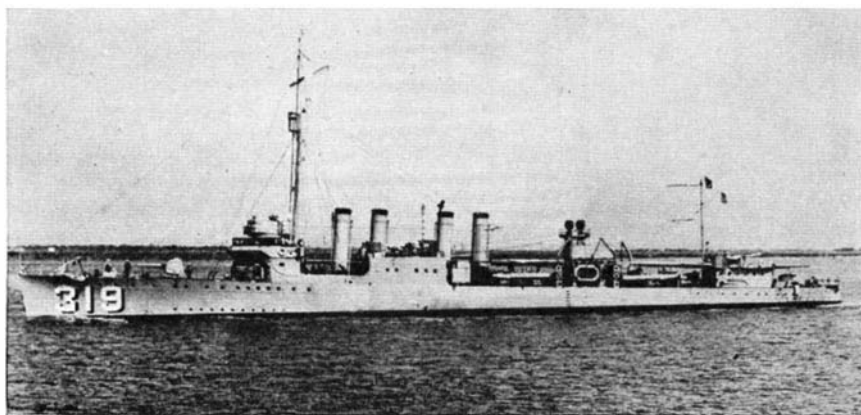
The Territorial Plan envisioned the addition to the Japanese Empire of vast sections of Asia. By a slow but thorough impenetration, Japan planned to take Manchuria, pass westward into Mongolia, and thence southward through Tibet in a China-encircling movement down to the very borders of India. Complete subjugation of China would follow easily, and it is possible that Japan's control might also encompass India itself. Indeed, together, the Maritime and Territorial Plans proposed the attainment of Japanese domination over the entire Pacific and over Asia. The ultimate result would be Japanese dictation of American policies in that Japan would strictly limit our commerce and trade in the Pacific, with Asia, even through our own Panama Canal, and perhaps with South America. It must here be noted that in normal times our trade in the Pacific and with the Orient exceeds the staggering sum of 2,000,000,000 dollars. To lose that might precipitate national bankruptcy.

Admiral Mahan (famous the world

over as a naval authority) said, in effect, some 30 years ago that if we do not keep the Philippines, we shall need a navy four times the strength of Japan's in order to preserve peace in the Pacific. Form and substance are given to this assertion by the facts that, prior to our acquisition of these islands, Japan was encouraging the Philippine party that was then agitating for independence from Spain; that during the intervening years Japan has given every support possible to the movement for Philippine independence from the United States; and that, when our Congress recently passed the abortive independence bill, the Japanese were the first to congratulate the islands. Why? Simply because the Philippines represent an important and rich acquisition for Japan in her program for obtaining hegemony of the Pacific. The opinion has been widely voiced recently that "the moment the United States flag is lowered in the Philippines, that of Japan will go up!"

ADMIRAL MAHAN might well have said that our responsibility in the Pacific, as a benevolent and unselfish protector of international rights, is second to that of no other civilized nation in the world. We desire no extensions of territory or political control in that region; we are interested solely in seeing that every nation is given the right to live, and in our Open Door Doctrine of equal commercial rights for all. The Japanese people have no reason to fear us!

Great Britain is no longer capable of exercising more than a moral defense against the aggrandizement of the Japanese War Party. She admits that her formerly strategic ports of Singapore and Hongkong are held "on the sufferance of Japan," and therefore she is at the mercy of Japan in the Orient. The Netherlands, with vast insular possessions in the East Indies, is impotent. France, with her Indo-China at the very door of Japan, is bound to her by the Franco-Japanese agreement of 1907 whereby the two powers guarantee mu-

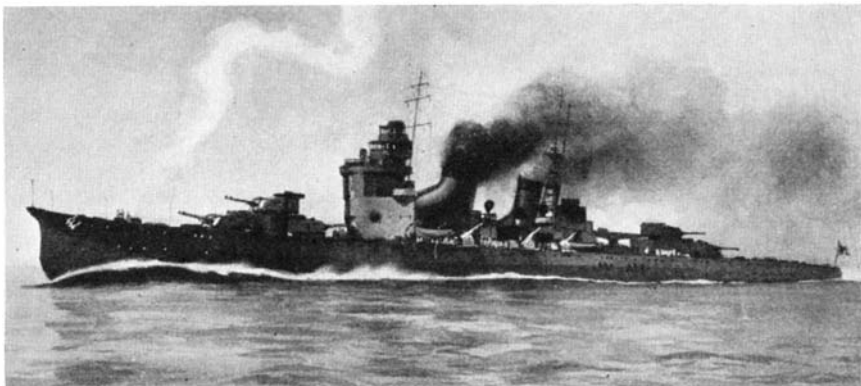


American destroyer *Kidder*, typical of American naval weakness. We have not built a destroyer since the war and possess not one vitally important leader

tual aid to assure security and peace in those regions of the Far East in which France and Japan have "territorial rights." Recently a French Government spokesman announced in the Chamber of Deputies that this agreement is still effective.

Prior to the World War, Great Britain found it necessary, in view of Germany's competitive naval construction and the European war which statesmen saw was inevitable, to withdraw the greatest proportion of her naval forces from all parts of the Empire and hold them in concentration near home waters. Since the war, conditions throughout the world have continued in such a turgid state that the British could not now dispatch quickly to the Orient a fleet sufficiently powerful to escape utter defeat in a short time. The responsibility thus devolves upon us, not only as a nation with Asiatic interests but as one whose prosperity and future progress depend upon an ever-increasing volume of maritime commerce, to build up our Navy to the point where we can protect our own foreign possessions, our Asiatic trade, and the lines of sea communication so essential to both. Our police duties in the Pacific are so great that, should other nations go to war in that section of the world, we would quickly become participants if our Navy were not strong enough to protect our commerce against the raids of the belligerents. America's experience during the World War definitely proves this!

OUR Navy at present is not equal to the task. Proportionately, it is growing weaker and weaker—as we shall see later—and so far as naval bases from which a defensive fleet might operate in wartime are concerned, we were emasculated by the Washington Conference for the Limitation of Armaments. In return for the Japanese agreement to sign, we agreed not to fortify any of our insular possessions that were not already fortified by the end of the conference. That agreement left us in possession of only one fort, Corregidor, at the entrance of Manila



The Japanese 10,000-ton cruiser *Nachi*, typical of the "ferce-face" might and majesty of Japan's militarist government. Japan's cruiser strength is high

Bay, while the remainder of the Philippines, Guam, Samoa, Midway Island, the Aleutians, and some smaller islands are at the mercy of anyone who might care to take them.

Corregidor is a powerful fort but, in the event of war with Japan, unless our fleet could make the 3500-mile trip from our nearest waters—Hawaii—and base there before the Japanese could send their fleet down in force—a mere thousand miles from Japan—it is doubtful whether Corregidor could hold out long. Munitions and supplies would have to be brought in, and this would be impossible if our sea lines of communication were closed by the enemy. Corregidor having fallen, we would have no base of any kind west of Hawaii in which our ships could refit after the long transpacific voyage, and we could not, therefore, decisively conclude the war in our favor. It would be easy for Japan also to cut off our supply of several products vital to us in wartime—such as rubber, for example—by an easily maintained blockade of our source of supply in the East Indies or by destroying our merchant ships in that part of the Pacific. As for our Pacific possessions—remember the speedy fate of Germany's colonies at the outbreak of the World War! And the Panama Canal, so vital to the movement not only of warships but of merchant ships necessary to our national existence—one well-aimed blow by Japanese secret

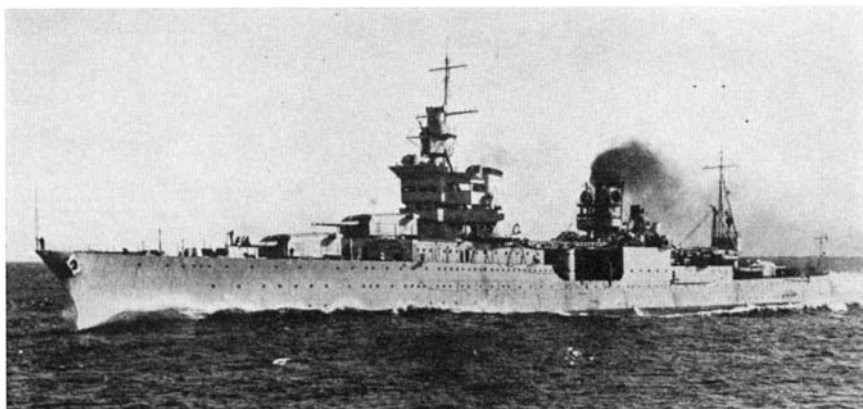
agents would put this out of commission before we could realize war had begun!

Japan, recently accused of fortifying the former German Pacific islands, which she has no right to do under her Mandate from the League of Nations, has denied that she is doing so. She is "improving harbor facilities," she says. But Japan has shown her expertness in concocting excuses and denials. The "improved harbor facilities" will be adequate for submarine and air operations! Having withdrawn from the League, she now claims full title to all these islands, and it is difficult to see how anyone can gainsay her.

AMERICANS fatuously believe that the Washington Conference was conceived by American diplomacy. That Conference was intended to promote international understanding, prevent competitive naval building, and prevent fear, but the invitations to it sent out by us, were the result of outside influences. Our idealism thus cost us the dominant position as a naval power, and a correspondingly persuasive voice in international issues. When the Conference was called, the naval ratio of the three powers with which we are concerned was approximately: United States 6, Great Britain 5, and Japan 3. We came out of the Conference minus the right to fortify our Pacific possessions and with a ratio of 5 to Great Britain's 5 and Japan's 3 in capital ships. This agreement meant the scrapping of much American tonnage. But instead of scrapping vessels rapidly growing obsolescent, we junked nine powerful ships on which we had already spent several hundreds of millions of dollars and which were practically complete. These nine had been designed primarily for Pacific duty; the ones we kept are, besides being old, scarcely adequate for that purpose.

After the Washington Conference we sat back with smug self-satisfaction and planned very little tonnage in categories not limited by the Conference. Britain and Japan, however, steadily built submarines, destroyers, and

(Please turn to page 300)



The *Indianapolis*, latest American 10,000-ton treaty cruiser. We have built nearer to our allowable treaty strength in this category than in any other



A typical example of damage to wheat by insects which can be exterminated by the method described

RADIO WAVES KILL INSECT PESTS

High-Power, Short-Wave Radiations Effectively Destroy Insect Pests but Do Not Damage the Infested Material

By J. H. DAVIS

Chief Engineer, Electric Traction,
Baltimore and Ohio Railroad Company

THE use of high-frequency current for medical purposes was first suggested by Tesla in 1891. Two years later d'Arsonval conducted some experiments on human and animal subjects with high-frequency waves using an indirect method and found these currents to act energetically on the vitality of tissue. In 1900 Hengstenberg found that high-frequency currents could be used for sterilizing substances of many kinds. Esau demonstrated in 1926 an ultra-short-wave therapy apparatus and Schliephake pointed out before the Berlin Medical Society that short radio waves furnish means of direct attack on pathologic foci which heretofore was possible only through the use of Roentgen rays.

IN September, 1926, Schereschewsky reported the results of his experiments on physiological effects on laboratory animals of currents of very high frequency. In December, 1927, the writer observed that the filament and gases in an incandescent lamp became luminous when held in close proximity to a high capacity antenna emitting six-meter waves. About this time it was observed that workmen testing radio equipment experienced an elevation of body temperature, and in 1928 Hosmer determined that this method could be used for producing in animals any degree of fever at will. A few hospitals are now using short waves for the production of artificial fever in patients undergoing treatment for certain diseases.

The writer was impressed by the observations and studies which he had made with the thought that short-wave energy, if of sufficient capacity and

concentrated in a narrow space, would constitute an effective agency for the extermination of insects in all stages of their development from eggs to adults. Radiated energy of this character will effectively penetrate dielectric materials without impairment and induce lethal temperatures in animal life which may exist therein. There is a real need for just such an agency as it is generally recognized that more effective means than those now available are necessary to reach and kill the eggs, larvae, and pupae which may be concealed within the host material.

It has been estimated that the annual losses in value of grain and other mate-

rials in the United States, due to the depredation of insect pests, is about two billion dollars. To mitigate the depredation of insects in stored grain

it is customary to withdraw it from time to time for "airing and cooling." The development of the eggs and larval forms within the material is temporarily arrested by exposure to cold air but when the temperature of the stored material is again elevated, due to respiration or other causes, the eggs are hatched and a new generation of pests necessitates repeating the cooling and airing operation.

IF the infested material is given a "killing dose" of high-capacity high-frequency electrical oscillations and reinfestation is prevented by proper storage and aeration, the product can be kept for long periods of time. Recent developments in the field of short-wave treatment and proper aeration, including the maintenance of proper temperature and humidity conditions, appear to make this possible. Records are available showing that two million bushels of wheat in storage for a period of about two years were withdrawn for cooling and airing 13 times, resulting in a loss equivalent to about 130,000 bushels, or one half of one percent for each withdrawal.

Certain species of weevils drill holes in the grains in which their eggs are deposited and the holes are so cleverly sealed that ordinary inspection methods fail to reveal infested kernels. Within three or four weeks, under favorable temperature conditions, these eggs will hatch. The growing insect consumes the inside of the grain and thus destroys it for useful purposes. The United States



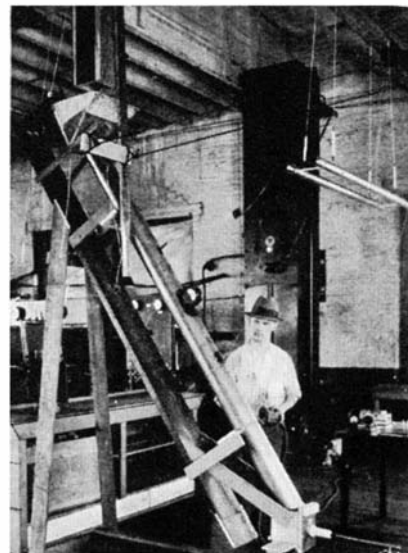
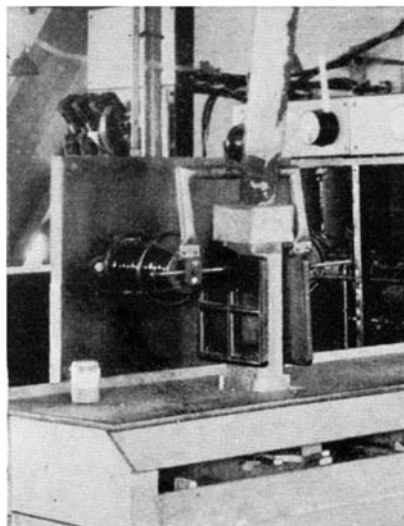
Left: Infested wheat in which insects were killed in six seconds.
Right: Untreated wheat destroyed

Department of Agriculture has estimated, assuming it takes four weeks for the weevil to mature, that the females and males are equal in number, that each female lays 200 eggs, and that all of these eggs hatch and live to maturity, that the possible increase of one pair of weevils in 24 weeks is two trillion weevils. It is not surprising, therefore, that grain and similar infested materials frequently lose their entire value by the depredations of these pests.

SEVERAL years ago the writer made some preliminary tests on small quantities of infested wheat with a view to determining if radio methods could be effectively used to exterminate the eggs and larval forms which may be concealed within the material, as well as the adult insects. Thirty and six meter waves were used, the former of low capacity and the latter of high capacity. The 30-meter low-capacity waves were effective in exterminating adult insects in small quantities of wheat within a period of about 90 seconds but the eggs later hatched out. With the 20 kilowatt, six-meter waves, an exposure of six seconds was sufficient to exterminate eggs, larvae, and adults. The writer received facilities from the Baltimore and Ohio Railroad Company to install a plant for the purpose of making a comprehensive series of tests on infested grain. This plant has been in operation for a year and many kinds of infested materials have been successfully treated including wheat, corn, flower and garden seeds, tobacco, spices, nuts, beans, peas, cocoa beans, packaged and bulk milled cereals, and so on.

The plant is equipped with a 20-kilowatt Westinghouse standing-wave oscillator operating at a fixed frequency of forty-two million cycles per second, seven meter waves, together with necessary accessories. Through suitable rectifying apparatus, the alternating current power supply is converted into uni-direction-

al current at from 6000 to 9000 volts and delivered to the plate circuit of the oscillator. Various forms of treaters have been designed and tested but further experience is required to determine the most efficient design. Most of the tests have been made using a rectangular glass chute type of treater placed between copper plates. Energy from the grid of the oscillator is supplied the treater through a transmission circuit. A thermal ammeter attached to



Above and at left: Types of wheat treaters used by Mr. Davis. The glass box unit is shown at the left

a "trombone" type of connection between the copper plates of the condenser is used to tune the treater and its contents so that maximum effectiveness of the oscillatory energy will be expended in the product undergoing treatment. Infested bulk material may move by gravity through the treater, the velocity of movement being accurately controlled to insure proper exposure for extermination of insect life.

Hundreds of tests have been made at this experimental plant using infested materials of various kinds and under various conditions of field strength at the treater, and various periods of exposure with material both in motion

and stationary. The following are examples of tests on wheat taken at random from the records:

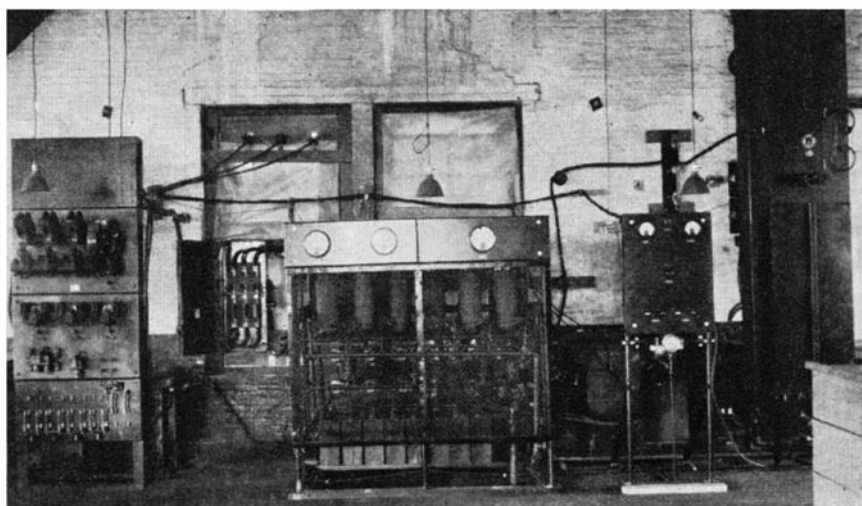
Time Exposure Secs	Plate Amperes	Oscillator Plate Volts	Temperatures of Grain		Number of Weevils Used	Number of Weevils Killed
			Before Treatment Degrees F	After Treatment Degrees F		
5	7	8800	88	120	13	13
5	5.5	7800	86	125	10	10
6	5.5	9100	86	131	6	6
3	5.5	7000	84	138	10	10
3	8	8000	87	140	9	9
9	5.4	7800	86	138		See note 1
5	6	7800	86	142		See note 2

Note 1—Untreated grain highly infested with weevil. All live weevils killed by treatment. No indications of further weevil development to date, a period of 5½ months.

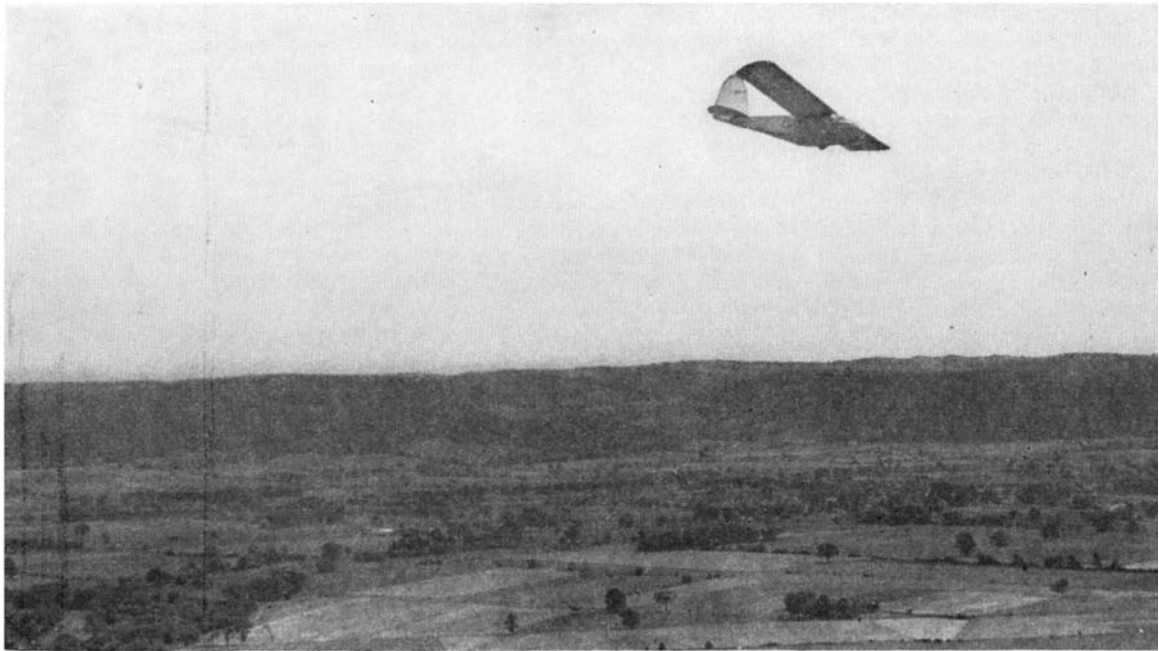
Note 2—Untreated grain highly infested with weevil. All live weevils killed by treatment. No indications of further weevil development to date, a period of 6 months.

THE equipment used in this experimental plant was that which was commercially available and not especially designed for the purpose to which it has been applied. Results of the writer's research work indicate definitely that weevils in all stages of their development, from eggs to adults, can be exterminated without injury to the germinating properties of grain, or appreciably affecting the moisture content, and without adversely affecting the food value. There are indications that the germinating properties of wheat and other seeds treated may be enhanced. Worms, mites, and other infestations of cocoa beans, spices, tobacco, nuts, packaged cereals, and so on, can be exterminated without injury to the products treated. Where the equipment is properly installed there are no adverse effects upon persons working or stationed in the vicinity of the apparatus.

Aside from the fact that temperatures lethal to animal life can be obtained, under proper conditions, without necessity for elevating the host materials to such temperatures, there may be other factors contributing to the demise of animal life in the stored grain, such as the effect of invisible light or other rays.



The original set-up for treating infested wheat by the high-frequency method described in the article. The 20,000 watt oscillator is shown at the right



A Franklin glider climbing over Big Flats near Elmira, New York

SOARING ON THE WINGS OF THE WIND

By **ARTHUR L. LAWRENCE**

Glider Section of the Rhode Island Aviation League

MOTORLESS flight is a sport superior to all others in which swift motion is a principal element. Neither skiing nor ice-boating, sailing nor any other surface sport dealing in speed is able to give the individual the exhilarating sensation provided by soaring in eagle-like flight in the invisible up-winds which sweep the earth's surface. Such currents have carried pilot and glider to altitudes higher than 7000 feet and for distances approaching 150 miles.

The development of aerodynamics since the World War has made possible the design and construction of the sail-plane, a type of aircraft the chief characteristic of which is a featherlike sinking speed of less than two feet per second when gliding forward at a minimum air speed of around 35 miles an hour. A gliding range or angle—the ratio of distance traveled to altitude lost—in excess of 20 to one is common to the soaring plane. This type of glider—known as a high-performance machine—weighs in the neighborhood of 350 pounds, is carefully streamlined, and has a wing span of approximately 60 feet. Such a plane must have a good safety factor—six to one or better—in order to withstand the violent stresses of cumulus cloud and storm front flying. The design engineer consequently has a nice problem to worry over, for a

60-foot cantilever wing weighing less than 200 pounds and made of spruce, plywood, glue, and paper-thin fabric must be structurally as strong, for the weight supported, as that of the average airplane wing.

A very simple principle is the basis of soaring flight. Given a moving air mass having a certain vertical compo-

nent of velocity, it is merely necessary to fly around in that particular portion of the atmosphere in a craft which has a lower sinking speed than the rate at which the supporting medium is rising, in order to soar—to maintain or gain altitude in a motorless plane.

ONCE the fact was determined that certain air masses in motion had vertical as well as horizontal components of velocity, the mystery of the unseen energy producing soaring bird-flight was explained. Methods were developed for measuring the vertical movements of air, and at the same time the aerodynamic characteristics of soaring birds were studied. The problem of man's soaring was then reduced to the design of aircraft having the flying characteristics of such birds as the albatross, hawk, and vulture, and capable of supporting the weight of a 160-pound pilot, to be flown in the up-winds made use of by birds. Launched into an up-wind zone in a glider—the windward side of a mountain, for example—human beings were able to soar.

The scientific study of vertical air currents has been conducted most recently by the Research Institute of the Rhön-Rossitten Society at Darmstadt, Germany, because of the important bearing which the subject has on all



The author of the present article in the cockpit of a utility glider

flying, and particularly on gliding. Professor Walter Georgii has been chiefly responsible for the amazing progress which has been made in Europe—not only meteorological but aerodynamical as well—in motorless flight, and it has been largely due to the technical aid and advice of one of his former assistants, Dr. Karl O. Lange, that such tremendous strides were made in the advancement of the sport last summer on this side of the Atlantic. Dr. Lange, in the United States for the past year, has been conducting meteorological research for the Massachusetts Institute of Technology. He headed a Tech party of weather experts at the Third National Soaring Contest, held in Elmira, New York, and was largely responsible for the excellent distance and altitude flights, the best of which established new American records.

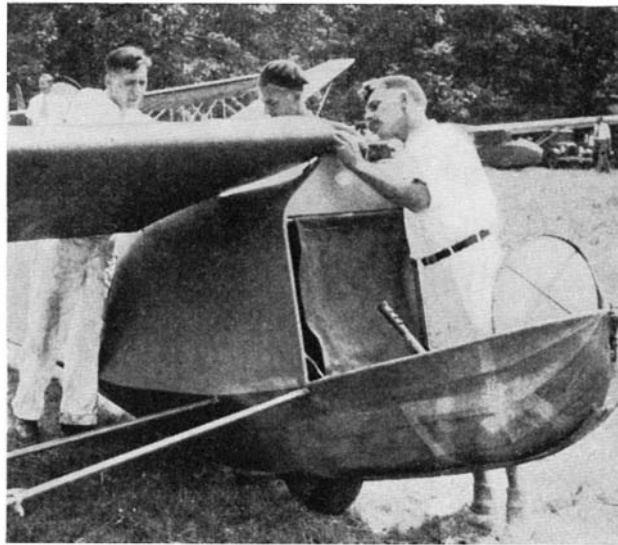
VERTICAL currents in the atmosphere are produced by the contours of the earth's surface and by unequal temperature distribution in various air masses. Convection currents set up in the air by temperature differences have vertical velocities up to and exceeding 50 feet per second in extreme or storm conditions.

Prior to the past summer, soaring in the United States was accomplished principally by means of slope winds, augmented to a greater or less degree by purely local thermal currents. A slope wind is most easily described as an inverted waterfall of air. Winds sweeping across a valley toward a straight or concave ridge must flow over it, and, depending on the angle of the slope, its height and the velocity of the air, may have vertical velocity components ranging up to and above 15 feet per second when moving with gale force. The up-swing of air, as it flows over the ridge, may reach a maximum distance of approximately two and a half times the greatest elevation of the terrain. In the case of a ridge facing a wide, cultivated valley, heat currents will be produced over the latter on a clear warm day, which will be carried against the ridge to augment the slope up-current, providing vertical air movements to much greater altitudes.

At Elmira, during the first two annual national contests, practically all of the soaring was done by means of the up-winds described, and records of seven and a half hours for endurance and 3000 feet for altitude were established, while distances of a dozen or so miles were covered. The procedure in ridge

soaring is for the pilot to work back and forth in an elongated figure eight while gaining altitude, and then to experiment with various areas for additional "lift" from thermal currents.

Last summer, cloud flying was accomplished by many of the pilots and with practically every type of glider entered. Jack O'Meara and Martin Schempp, with German sailplanes, established the new American distance and altitude records, while 16-year-old Robert Eaton, in an American utility



Putting in place one wing of a utility glider. Motorless planes are easily taken apart for transportation

glider, exceeded the previous year's records in both events. O'Meara, flying his *Chanute*, reached an altitude of 4800 feet above his starting point and covered an airline distance of 67 miles; Schempp, in the *Schloss-Mainberg*, climbed to 5400 feet above the point of take-off and traveled 63 miles. Eaton's Franklin was designed as a training ship and has about two thirds the performance of the sailplanes; that is, it has greater sinking speed, a lower forward normal gliding speed, and a smaller gliding ratio. It, however, reached an altitude of over 3400 feet, and covered more than 29 miles on its best flight.

The clouds used for this type of soaring are the large billowy cumulus formations one sees on a summer's day. They form when warm masses of relatively moist air, rising up into cool regions, are chilled to a degree where the absolute humidity point is reached and condensation of the vapor takes place—usually between 4000 and 8000 feet. As the invisible vapor turns to cloud, the heat of condensation is liberated, which gives the air mass a new impetus upward.

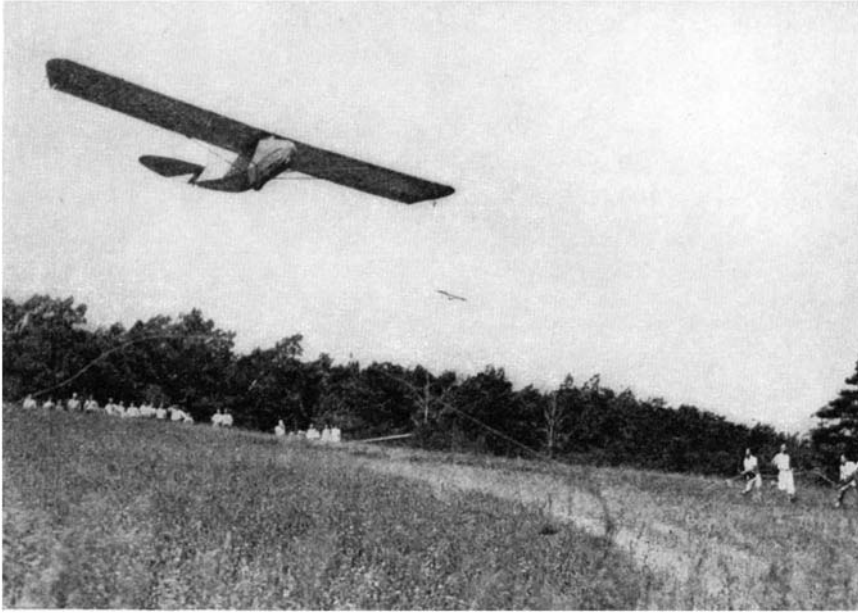
Under and in one of these clouds, therefore, is a column of rapidly rising air which may reach a velocity as great as 25 or more feet per second. The cloud mass bobs up beyond its point of

equilibrium, however, and soon the process is reversed, with a down-current and the dissipation of the cumulus. The time of the cycle is relatively short, and the soaring pilot has about half an hour from the time the cloud has started to form until he must leave it or be forced earthward more rapidly than he was lifted up.

A particular technique is used for distance soaring. The pilot starts off in the slope wind but is ever on the look-out for a suitable cumulus on which to "hook." Soaring back and forth, he jockeys for position, and when he is satisfied that a forming cloud is drifting toward him, he sails out to meet it. Soon his altimeter, or, if he has one, his variometer, shows a rapid rate of climb. When well into the zone of rising air, the pilot starts to circle and the glider rises in a graceful spiral, drifting with the cloud back over the ridge and entirely independent of any slope current.

It is easy going until just before the cloud level is reached. Unless equipped with a parachute and blind-flying instruments, it is extremely dangerous to risk being drawn into the turbulent fog, and even so equipped, the wise pilot dives away from his source of energy. Assuming that the pilot reaches an altitude of 5000 feet before he is obliged to dive out into horizontally moving air, he then has about 20 to 30 minutes to glide around, constantly losing altitude, while searching for a new source of "lift." From this altitude he is able to glide a distance of about 15 miles in quest of another cloud or a ridge. He is usually able to reach a position under a suitable cloud, when he begins the process all over again, spiraling upward to new heights and continuing on his way.

THE course is always with the wind, for then he is able to add, rather than subtract, the wind's velocity to the air speed of his plane and thereby cover a much greater distance. Finally, when in the late afternoon the cumulus clouds begin to thin out and grow smaller, and the wind dies down, it becomes necessary to find a suitable landing field. Any hay-field or meadow is all right if it is large enough and is situated near a highway so that a ground crew with the trailer may reach the glider. Occasionally, the over-zealous pilot, in his desire to set a record, waits too long or gets caught napping. He then has to land in a hurry—frequently in a nice clover patch, among the corn,



Taking off from South Mountain near Elmira. Note the launching cord and the ground crew at the right. Another glider of the same type is in the distance

in someone's back yard, or even in a river.

There is one type of up-wind which has not as yet been successfully employed for soaring in America, though it has been used by German pilots for flights which set new world's records. This is the cold front, in which are to be found the most violent vertical currents. Advancing cold fronts are what produce thunder storms, line squalls, and other bad weather. A wall of cold and therefore heavy air, moving rapidly along the earth's surface displaces the warm light air which shoots upward with a velocity as great as 50 feet per second.

The cold front may stretch for hundreds of miles laterally to its path. Just in advance of it stretches the warm up-wind. The pilot sails along and in this up-wind zone, his actual course being the resultant of his glide parallel to the front and his drift with it.

WHILE no instruments are necessary for ordinary slope-wind flying, they are absolutely essential for cross-country soaring. Unable to tell whether he is rising or falling, except when there comes a change in vertical direction or acceleration, the soaring pilot must depend on his altimeter and variometer to tell him what is happening. The former shows him his vertical distance above his starting point and the latter indicates his rate of climb or fall in feet or meters per second. The air-speed indicator is the next most essential instrument. At the slowest possible forward speed above a stall, a glider has its lowest sinking speed. Diving gently will give a slightly higher sinking speed but also a disproportionately greater forward speed, and therefore, the best gliding ratio. Each particular

glider design has definite air speeds at which these characteristics are obtained, and it is essential for the pilot to fly his glider at the proper air speed for the results he desires. A turn and bank indicator is essential only for blind flying in clouds.

There is nothing haphazard to the course taken by the pilot on a distance flight. Definite routes are laid out in advance, and these are planned so that advantage may be taken of the most favorable terrain. The contour maps for an area of several hundred square miles around the center of a soaring region such as Elmira, for instance, are studied with great thoroughness by all pilots until the location of every ridge and valley is memorized. What seem the best courses for various wind directions are then planned. The pilot must presuppose a certain amount of altitude to be gained on one ridge, which will permit him to glide to the next; or a

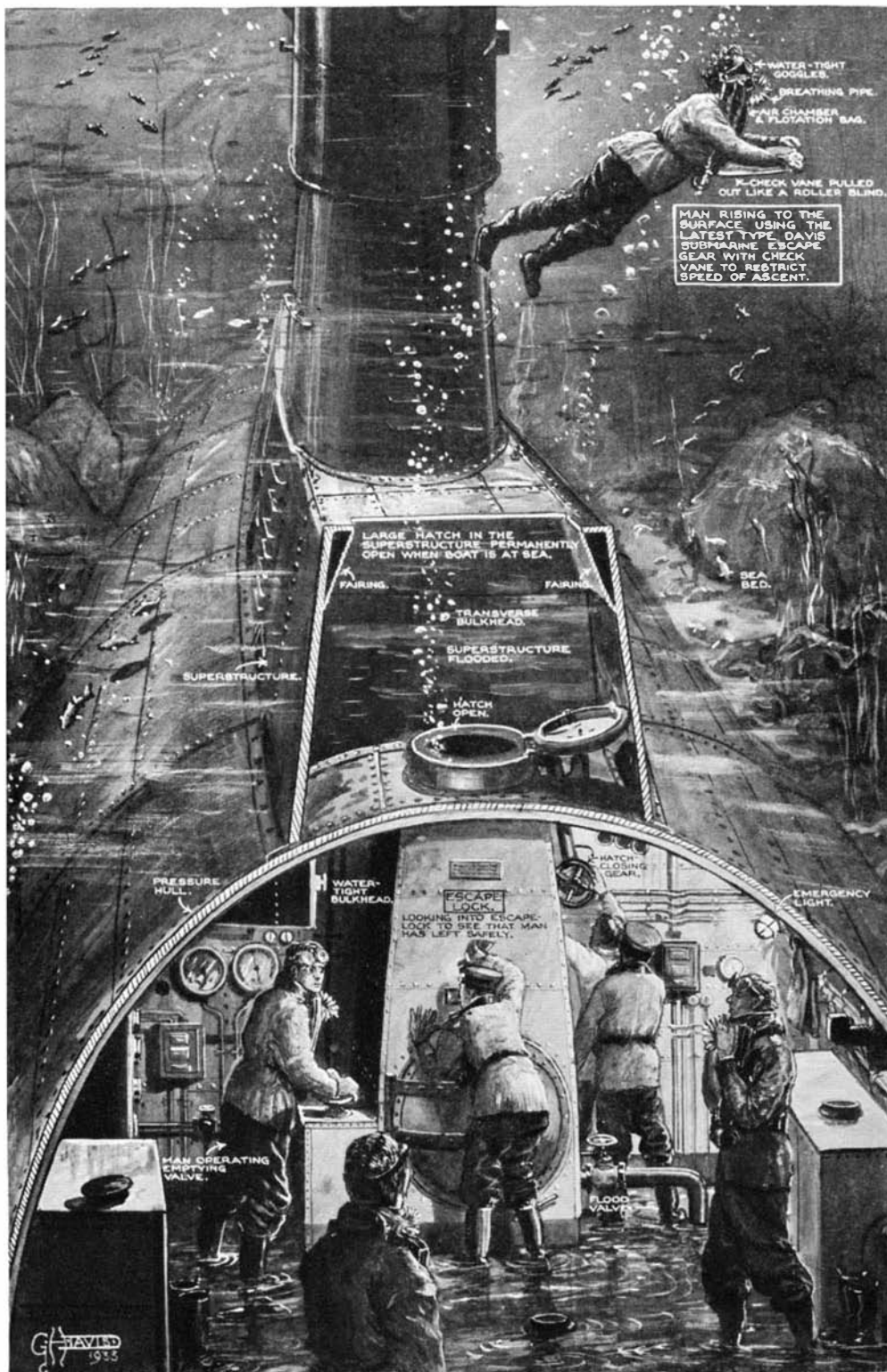
start by means of a cloud from an isolated soaring location that will enable him to get to a range of hills, which he can then follow for many miles. With the mental picture of a pre-determined course in mind, the pilot then sets out on his fascinating adventure. Utmost patience is needed and the successful pilot is the one who has an abundance of that quality, for he may have to maneuver for an hour over one location before getting the thermal current or cloud boost to send him on his way.

WITHOUT complete meteorological data and the help of a weather expert familiar with soaring to interpret it, to forecast the favorable flying conditions sufficiently in advance for the pilots to be ready on a particular ridge before they develop, and suggest to the bird-men what type of up-currents to expect and what routes had best be followed, distance soaring can not be done successfully. To Dr. Lange and his assistants goes the credit for last summer's performances—more than 20 distance flights and approximately 200 hours of soaring time.

There is no sport which is as scientific as motorless flight. The successful soaring pilot must not only be skilful in handling his plane but also needs to be something of a meteorologist. He must have courage and patience to a high degree and must be a thorough and painstaking student of his avocation. It takes years to become an expert; the group ranking as such numbers only ten in the world. A special rating has been made for them—the "D" license—which is given for the following accomplishments: a total of over five soaring hours; a distance flight of at least 50 kilometers; an altitude flight to 1000 or more meters above the starting point. O'Meara and Schempp are the two pilots in America who have fulfilled the "D" license requirements; the other eight pilots are Germans.



The author slipping a glider in to a spot landing

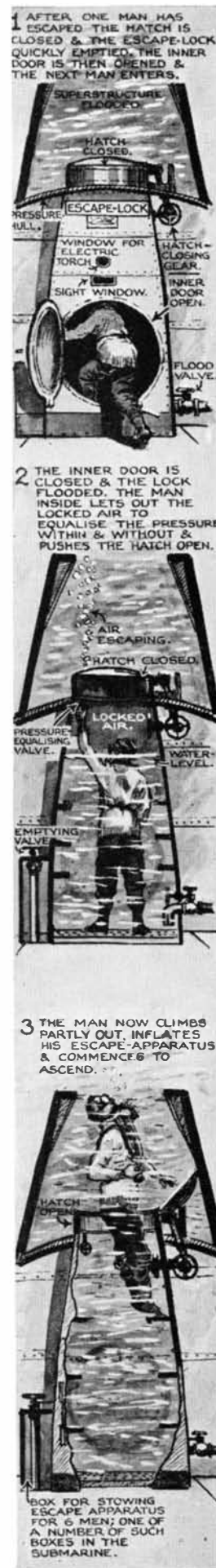


Courtesy The Illustrated London News

ESCAPE FROM A SUNKEN BRITISH SUBMARINE

THERE have been so many submarine disasters in recent years that navies are now very much concerned with the rescue of the crews of sunken submarines. The drawings above show the type of escape lock that has been or is being fitted to all British submarines. When a submarine so equipped sinks to the ocean bottom, the men don the Davis Escape Apparatus which consists of a suit that is slightly inflated with air for buoyancy and a mask (somewhat similar to the

American Momsen "Lung") through which air for breathing is supplied. Then one man of the crew passes into the escape lock, which is closed behind him. Water from the open hatch above pours in until pressure is equalized, and then the man crawls through the round hatch and floats to the surface. The round hatch is closed, water in the escape hatch is dumped into the submarine, and the escape hatch is then empty, ready for the next man. The drawings explain mechanism details.



MEASURING THE COUNTERGLOW

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

ON any cloudless, moonless spring evening, as the long western twilight fades, the sky remains brighter in one region than the rest. Rising from the point of sunset, with a little inclination to the left, is a tapering wedge of faint light, broader and brighter at its base than the Milky Way, and fading out gradually at its summit and along its sides. This "zodiacal light" has been known from ancient times, though many people have never noticed it. In clear air, away from artificial lights, it is really conspicuous.

The central line of this luminous area coincides with the ecliptic (whence its name—zodiac, ecliptic). This suggests that it belongs to the solar system as a whole and not to our own planet, and proof that this is true comes from watching it for a few weeks. The zodiacal light is not fixed among the stars but moves along the ecliptic with the sun. On the opposite side a similar luminous region, widest near the sun and gradually narrowing, extends westward in the sky and can be seen before sunrise. The two are evidently parts of one luminous region surrounding the sun in the heavens, and elongated in the plane of the ecliptic. If only the moon were nearer us, or larger, so that a total solar eclipse was really dark, we could see the whole affair at one time. But, even in the longest eclipses, it is drowned by the general illumination from the corona and the sunlit sky a hundred miles away.

THE origin of this faint glow is obvious. There must be an extended though excessively thin cloud of fine particles—meteors or specks of dust—surrounding the sun and shaped like a thickish double-convex lens with its edges in the plane of the planetary orbits. Each separate particle pursues its own orbit about the sun but, though individuals move, the cloud as a whole maintains its size and shape and its gradual increase of concentration toward the center. The individual specks, though sunlit, are far, far too small to see, but the combined light of millions on millions of them suffices to produce the faint and apparently uniform illumination of the sky which we behold.

On spring mornings and autumn evenings the central line of the light lies at so small an angle with the horizon that it is hard to see, but on spring

evenings and autumn mornings it stands almost straight up and is conspicuous.

How far one can follow the tapering outer ends depends on the clearness of the air. With good skies, undisturbed by man-made illumination, they can be seen to run on and on till the morning and the evening halves of the light meet or are joined by a faint "zodiacal

of the human retina, though more sensitive to fine detail than the rest, are less so to very faint illumination, and an ill-defined glow is better visible when moving than when at rest.

WE cannot move the skies, but we can cast our glance rapidly through a wide angle and so cut a swath across the heavens, fixing our attention not on the stars but on the brightness of the background between them. If we sweep our vision thus up and down over a clear, dark, starry sky we should become aware of a definite but not sharply bounded band of light, slightly brighter than the rest. Noting its position among the stars and referring to a celestial map, we find that this band lies along the ecliptic. If we sweep our gaze lengthwise of this band we will realize that there is one region where it is wider and a little brighter than elsewhere. This ill-defined, roundish glow, 20 degrees or so in diameter, is the Gegenschein. As the sun moves, so does this faint glow, keeping always opposite. In December and June this takes it into the Milky Way, in whose greater brightness it is lost. One may lose it, too, if—as on the day when this is written—one or more bright planets are near opposition, for their light confuses the eye. An observer who had accustomed himself to looking for the Gegenschein might still detect it if he could hide the planet behind a suitable blind that did not obscure the surrounding sky.

Under any ordinary conditions the Gegenschein at best is elusive and hard even to see. Many keen-eyed observers have nevertheless located its center among the stars from night to night, and verified that it moves eastward along the ecliptic opposite the sun. It has even been photographed by more than one observer, but few if any measures of its brightness have ever been made.

This gap in our observational data has recently been filled by Professor Elvey of the Yerkes Observatory, working with a very delicate photoelectric photometer. This instrument is so sensitive that it will measure with considerable percentage accuracy the light from a region of the sky of only an eighth of the moon's apparent diameter. By picking regions in which no star, visible to the naked eye or in a

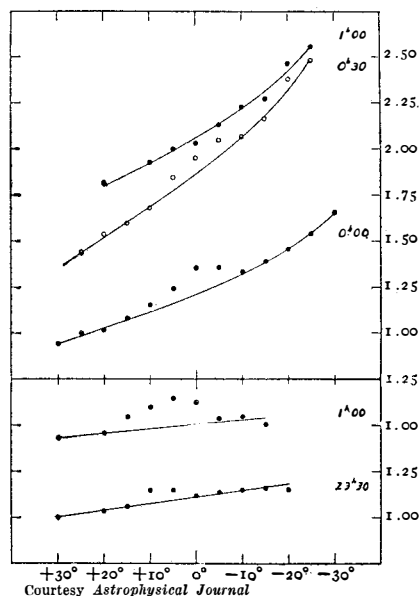


Illustration cross-sections of the Gegenschein. Scale at bottom gives declinations. Readings were taken at 5-degree intervals along hour circles. Vertical scale gives rate of charging of photoelectric photometer. Humps in the line of dots above the normal curves reveal the added illumination wherever the Gegenschein was crossed. The three upper curves were made on a single night, and, since the moon was steadily rising, the illumination of the sky was steadily becoming greater (each curve starts above the last). The lower curves have identical initial value (note margin) because the night was moonless

band" extending clear round the sky. Upon this band, and directly opposite the sun in the heavens, is a brighter spot called the Gegenschein, or zodiacal counter-glow. Its German name was given by its discoverer Brorsen, about 80 years ago. These extensions of the zodiacal light, unlike its central portions, are exceedingly faint and by no means easy to see. Large, faint, diffuse luminosities are not best seen by looking directly at them. The central regions

small telescope, appeared, he secured reliable measures of the sky background. These, as usual, increased steadily toward the horizon, owing to light originally in the earth's atmosphere—a part of which, at least, is similar in nature to a permanent aurora. By plotting the measures at different altitudes this steady change was allowed for, and a definite hump appeared in the line of plotted points wherever the instrument had swung across the Gegenschein.

By this laborious means the whole region opposite the sun was surveyed on several fine nights, and the region of brighter sky was definitely located. Its center was always very nearly opposite the sun. Its diameter is hard to measure, as it fades out gradually, but the measures average about 30 degrees.

THESSE facts were known before, but the new method tells us what we did not previously know, namely, the actual brightness. Even the central regions are so faint that the light from a whole square degree equals only that of a star of magnitude 6.4—barely visible to a keen eye. This is the excess of light above the general sky background which, even when apparently dark, is about twice as great.

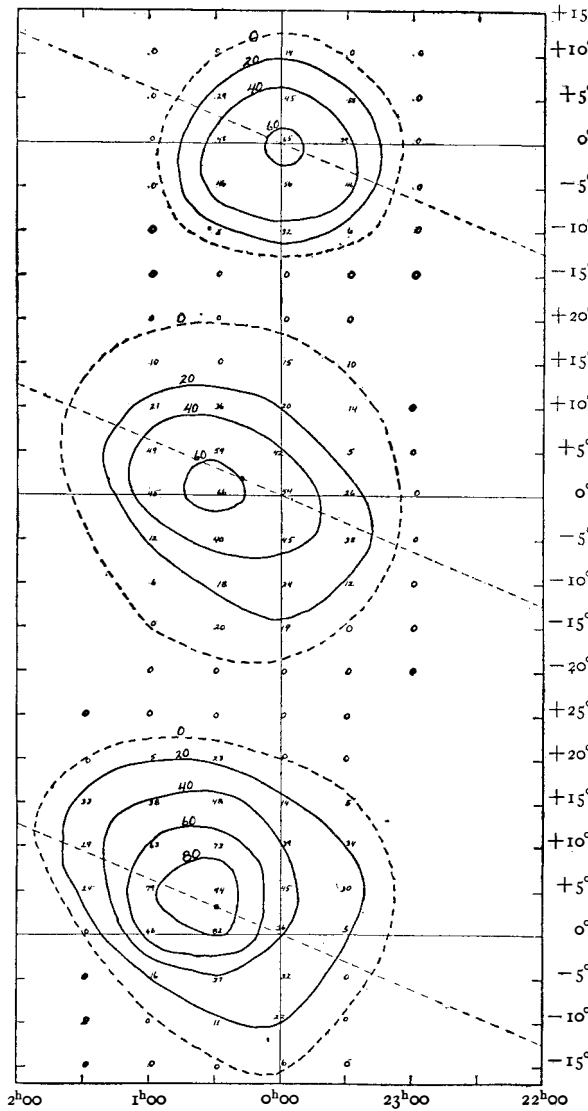
It is no wonder that the Gegenschein is not an easy object. Its total brightness (allowing for this background) is, however, surprisingly large. Elvey's measures on three nights give an average equal to the light of Arcturus! It is only because the light is so widely spread out, and fades away so gradually, that we find it difficult to see.

Still fainter illumination of the same nature as the zodiacal light and the Gegenschein covers the whole heavens. Measures by Van Rhijn show that it contributes more to the sky "background" (really the foreground in this case) than do all the telescopic stars.

This general illumination and the zodiacal band find a very simple explanation in the assumption that the lenticular swarm of particles which surrounds the sun extends beyond the earth's orbit, but not very far. In the plane of the ecliptic we are looking from the inside through the thin edge of the swarm, and get many more par-

ticles per square degree than at right angles to the ecliptic.

So much for the zodiacal band. But why is this brightest just opposite the sun, where we might expect it to be faintest? Two explanations have been given. Professor Searle of Harvard, many years ago, pointed out that all small, rough-surfaced bodies, from the moon to the tiniest asteroids, appear brighter when in opposition than when they are 10 or 20 degrees away, after all allowance has been made for differences in distance. When such a body is just opposite the sun, every little roughness on its surface hides its own shadow. But, if it is out of line, the shadows creep out and, though they may separately be quite invisible, they combine to weaken the reflected light. At about the same time Professor Moulton of Chicago showed that the effect of the combined attractions of the earth and sun would cause a certain concentration of the particles into a region about a million miles from the earth, on the side opposite the sun. The individual particles do not remain permanently in this region but their orbits and their rates of orbital motion are such that they tend to crowd there. This, again, should cause a brightening of the sky opposite the sun.



Courtesy *Astrophysical Journal*

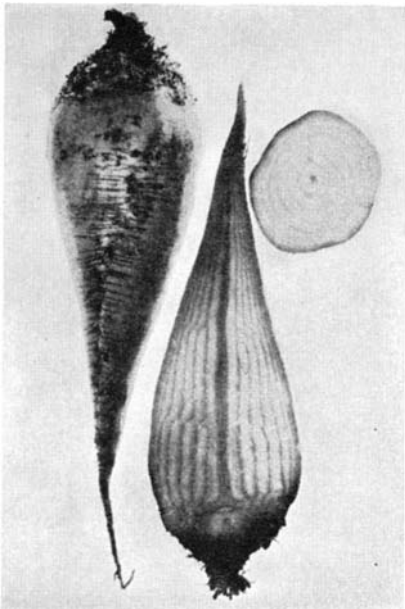
The Gegenschein or counter glow is not the zodiacal band but only that slightly brighter part of it which is opposite the sun. Above are isophotometric maps of the Gegenschein locality on three different nights, showing that it varies slightly. Figures at the right relate to celestial latitude, three sets of latitude figures being run in together merely for convenience in making the drawing. Figures across the bottom relate to celestial longitude. As the total width shown corresponds to 4 hours of earth rotation, or 60 degrees of arc, these maps therefore show a Gegenschein about 30 degrees in diameter. Only the central part, however, is bright enough for visual observation. The dotted line represents the ecliptic. Individual photometer readings are shown in numerals in a square pattern—the greater the reading the stronger the illumination observed. Heavy black dots represent the exact "anti-sun" or point in the sky directly opposite the sun. The circular lines ("isophotes" or lines of equal illumination) are interpolated after the readings are recorded, much as contour lines are interpolated between scattered elevation readings when making a topographic map. The photoelectric photometer operates in the following manner: Whatever illumination reaches it generates an electric current photoelectrically. This current charges a cell, and the rate of charge in millivolts per second for the area observed (about 1/15 of one degree in diameter) is read. The actual measurements on the Gegenschein are not quite so simple as this, since the rate of charging for the general sky illumination must first be read, after which the shutter is closed and the combined rate of charging due to the dark and leakage currents are allowed for. Both diagrams are by Prof. C. T. Elvey and are taken from the January 1933 number of *Astrophysical Journal*.

AT a distance of a million miles a single body, to reflect as much light as the Gegenschein sends us, would have to be about six miles in diameter. At another million miles distance its diameter would be some 25 miles. If, as a wild guess, we were to suppose that the particles forming the Gegenschein were an inch in diameter, there would be about 2500 billion of them scattered through a region half a million miles in diameter. This allows about 30,000 cubic miles for a single particle smaller than a golf ball—which is not exactly close packing. Probably the particles are much smaller; if they were one thousandth of an inch in diameter there would be a million times as many, but they would still average a quarter of a mile apart. It is no wonder that the Gegenschein is transparent! Yet, if all the fine dust could be gathered into one pile, there would be 30,000 cubic yards of it and it would weigh about 70,000 tons.

SWEET

Economic Aspects of the Sugar Beet Industry; How the Sugar is Extracted

WHEN you sweeten your coffee in the morning, do you ever wonder whence came the pure white crystals that fill your sugar bowl? Would you be surprised to learn that this sweetness could have been extracted from a palm tree? Would you be interested to know that this sweet gravel (the word sugar comes from the Arab, "sukkar," meaning gravel) is the quickest, the most efficient, and the cheapest of all energy foods and yet in hard times its consumption falls off as if it were a luxury rather than a necessity? Would you be encouraged



The sugar beet is "topped" and the leaves cut off before being processed to extract the sugar. The photograph of the vertical section shows the cells where the sweet matter is secreted and the cross-section shows the concentric growth rings

by the report that in the third winter of this depression 100,000 American farmers in 18 states and 76 American sugar mills produced more pure sugar than ever before? Sugar is the one major farm crop of which we are not producing a domestic surplus.

The sugar with which we sweeten foods and beverages is made up of 12 parts carbon, 22 parts hydrogen, 11 parts oxygen. To the chemists this



sugar, $C_{12}H_{22}O_{11}$, is sucrose, and although it can be extracted from certain palm trees, sugar maples, and other plants, most of it comes from the sugar cane of the tropics and the sugar beet of the temperate zones. Regardless of its source, when it is refined to the degree demanded, sucrose is exactly the same in sweetness and purity. Chemists cannot tell the difference between cane sugar and beet sugar nor can they produce sucrose synthetically on a commercial scale.

Sugar was introduced into Europe by Arab merchants who sold it to the chemists of the time for use in medicines. We know that Queen Elizabeth used it as a table delicacy. It was not, however, until the time of Frederick

BEETS

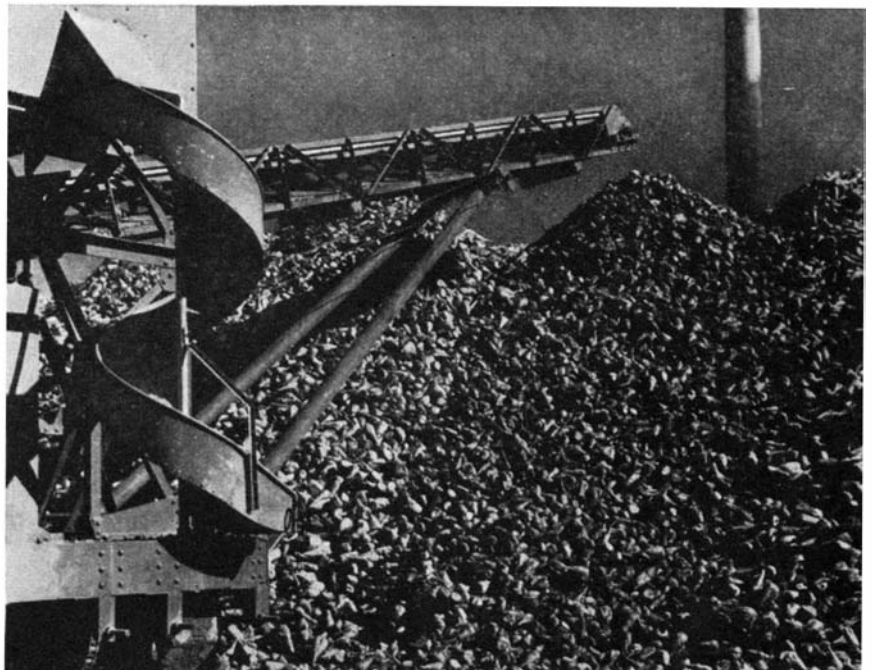
By A. P. PECK

One hundred thousand farmers in the United States raise sugar beets. These beets, large specimens from California, are "topped" for factory

the Great and subsequently Frederick William III, who both financed the experiments of Marggraf and Achard, that the white forage beet came into use as a source of sucrose. Napoleon by an edict in 1811 established the beet sugar industry as a rival to cane sugar. These are some of the highlights of the comparatively recent history of this now essential commodity.

In this country sugar cane was transplanted in Louisiana where it thrived. Later the Mormons brought heavy beet-sugar machinery from France across the Atlantic and up the Mississippi to Fort Leavenworth, Kansas, and then painfully hauled it across the plains and mountains by ox-teams to Salt Lake City. All efforts to establish the beet sugar industry failed, however, until the United States Government lent a helping hand.

Present-day facts about this essential American industry are not generally known. For example, there is the surprising news that despite a falling of sugar consumption from 108.13 pounds per capita in 1929 to 93.29 pounds per capita in 1932, the United States pro-



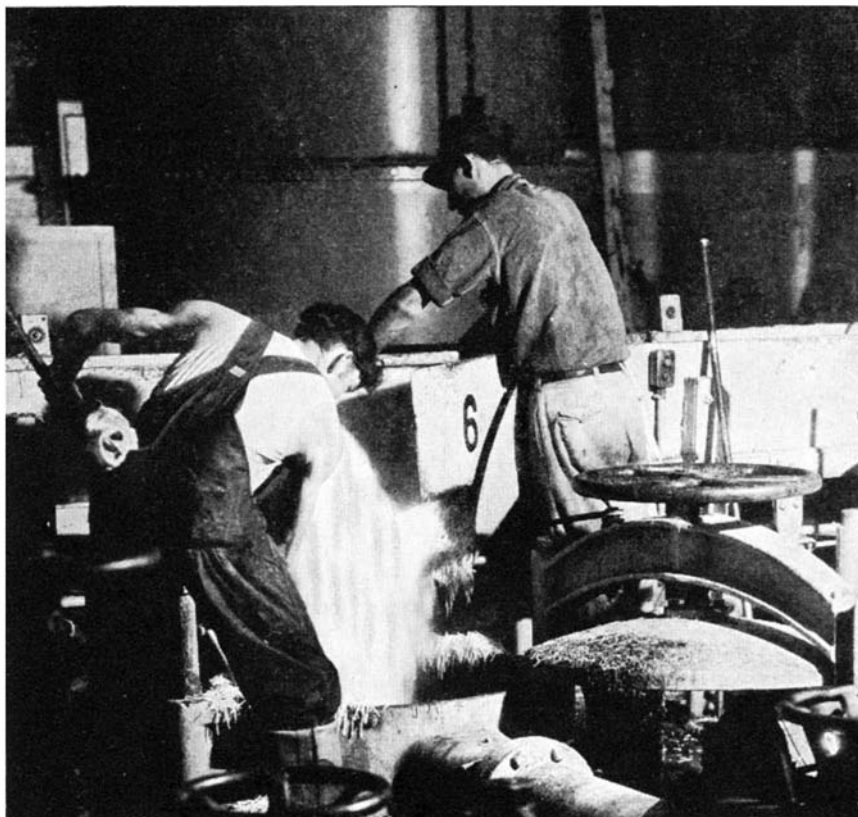
Photographs by Arthur Gerlach

There are several methods of factory beet piling. Here is shown an efficient device which receives loads from trucks and carts. This piler runs along a track

duced more beet sugar during this winter of 1932-33 than ever before and, for the first time in history, went into first place in world production. Undaunted by tumbling sugar prices, three fourths of the American beet sugar mills were opened to process the crop of 100,000 farmers with the result that Germany went into second place, Russia into third place, and France into fourth place in world production, according to latest estimates by *The Weekly Statistical Sugar Trade Journal*, New York. This record was due chiefly to diversification of crops and careful cultivation which raised the sugar content to an average of 16.36 percent of the beet, by weight, and to increased efficiency in factory practice which resulted in higher extraction of sugar. Last year (1932) although the farmers harvested 208,000 tons less beets than in the peak year, 1930, the factories extracted 100,000 tons more sugar, to reach a total of 1,308,000 tons.

THE little journey of the beet to the sugar bowl is almost as interesting as the history and development of this once wild root which nourished the pyramid builders. Seed is planted in the spring and the beets are harvested late in the fall so that they may have as much time as possible to store sugar in the root. However, they must be taken from the ground before a heavy frost.

The cultivation of beets requires deep plowing, harrowing, drilling holes for the balls of seed, heavy fertilizing, hoeing, thinning, lifting and topping, and finally harvesting. The beets are lifted or pulled and the tops are cut off at just the proper place and then they are hauled to beet receiving sta-



Sliced beets are poured from a carrier into the tanks of a diffusion battery and soaked in water. Carried from cell to cell, beets give up 95 percent of juice

tions or to the factories by truck, railway, or, as in some parts of California, by barge.

At the mill they are made into pure white granulated sugar by a continuous process which keeps the machinery humming 24 hours a day, seven days a week, for about three winter months. This manufacturing period is called a "campaign." The mills, most of them modern in appearance as well as in

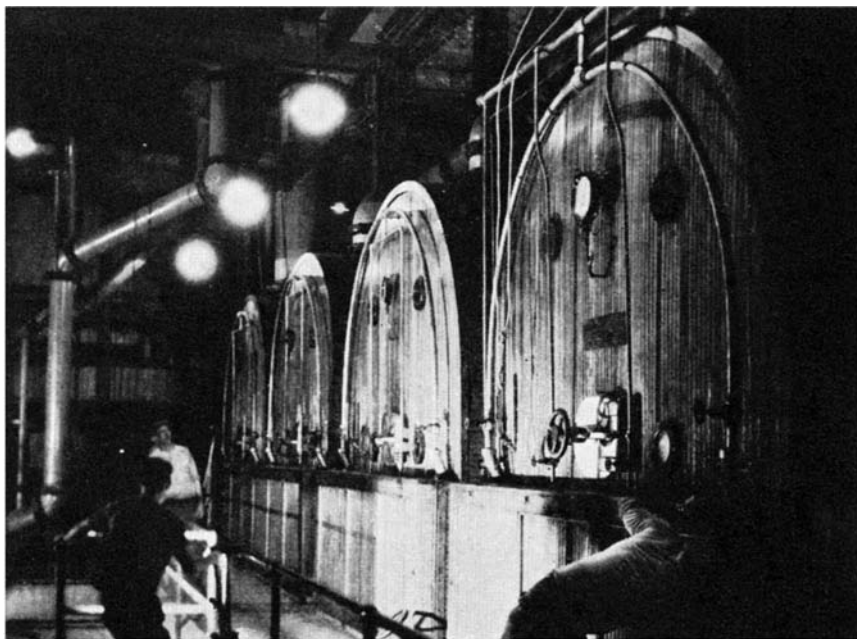
equipment, light up the landscape of 14 states and process beets from all those and four near-by states—18 in all. Every department usually operates on three shifts of eight hours each, for the factory must not stop.

When the beets reach the mills or the receiving stations, the wagon or truck load is weighed, samples are taken for a test of sugar content, the beets are dumped, dirt is caught through a screened trap, and the wagon is re-weighed to get the net beet delivery. The farmer is given a statement of net weight and sugar content and he goes on his way for more beets.

THE factory then starts its long grind. The beets as they arrive flow through flumes into the mill, where they are washed carefully and weighed. Then they are carried by machines that cut them into thin slices or "cassettes" (the sugar-mill workers call them "noodles"), along a belt carrier to the diffusion battery, usually a series of 14 big tanks or cells.

Into these tanks the "noodles" are packed and immersed in warm water until about 95 percent of the juice is extracted. The pulp which remains is saved and used—dried or mixed with molasses—to fatten domestic animals.

The raw juice from the diffusion battery is pumped into heaters as a first step toward removing impurities that would interfere with evaporation and crystallization. From the heaters the



Carbonating tanks where carbon-dioxide gas is pumped through the juice which occupies only one-third of the space, to allow for frothing before precipitation

juice is passed to mixers where it is treated with lime prepared in kilns which also make gas for purifying purposes. The lime is fed into the mixers, either dry or mixed with water to a creamy consistency known as milk of lime, and added to the juice in an amount which varies according to the quantity and nature of impurities to be removed.

This limed juice then flows into carbonation tanks to be purified by carbon dioxide gas from the lime kilns. The liming and carbonation precipitates the non-sugars and the lime. Carbonation is continued until the juice contains about one thousandth part of free lime. Then the juice is pumped through heaters after which it is passed through filter presses which retain the precipitated non-sugars and lime cake. From the filters the juice appears as a clear, deep yellow liquid. To make certain, however, that all traces of lime have been precipitated, and that no impurities remain in the juice, there is a second carbonation and filtration process. Even then the juice contains a trace of ammonium, sodium, and potassium carbonates which would become viscid upon boiling, and so further clarification is necessary. Sulfur dioxide is passed through the juice to convert the lurking carbonates into sulfites which not only boil more freely but further clarify the juice.

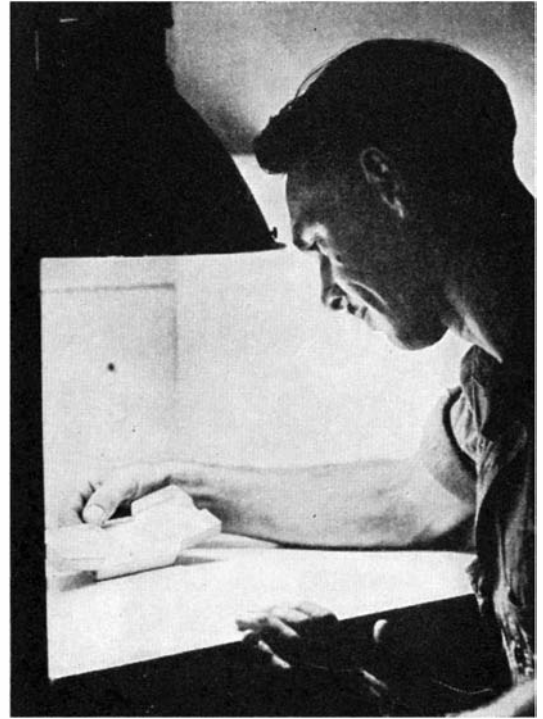
AFTER this purification process, the juice is concentrated in evaporators—usually three, four, or five tanks in series. Boiling at low temperature, the juice flows from one vessel to another, its concentration increasing until the water content has been reduced

by about 75 percent. This resulting syrup then is pumped through filters to vacuum pans where it is boiled at a temperature low enough to prevent caramel formation.

When the syrup reaches what is known as the "graining point," which is indicated when the liquid flowing over a glass plate forms a thin layer of crystallizing sugar, it is known as "massecuite." This is passed into crystallizers—horizontal cylindrical tanks in which rotating stirrers gradually cool the massecuite. This gradual cooling results in retarded crystallization.

At the proper point the massecuite is discharged into centrifugal machines which are fitted with baskets of finely woven brass screen attached to a vertical spindle. Rotated at about 1000 revolutions per minute, the centrifugals separate the liquid from the crystals which are retained on the screens. The hot, moist sugar is discharged to a conveyor which carries it to a granulator where it is cooled, dried, and screened. Then it is sacked and sent to the factory warehouse.

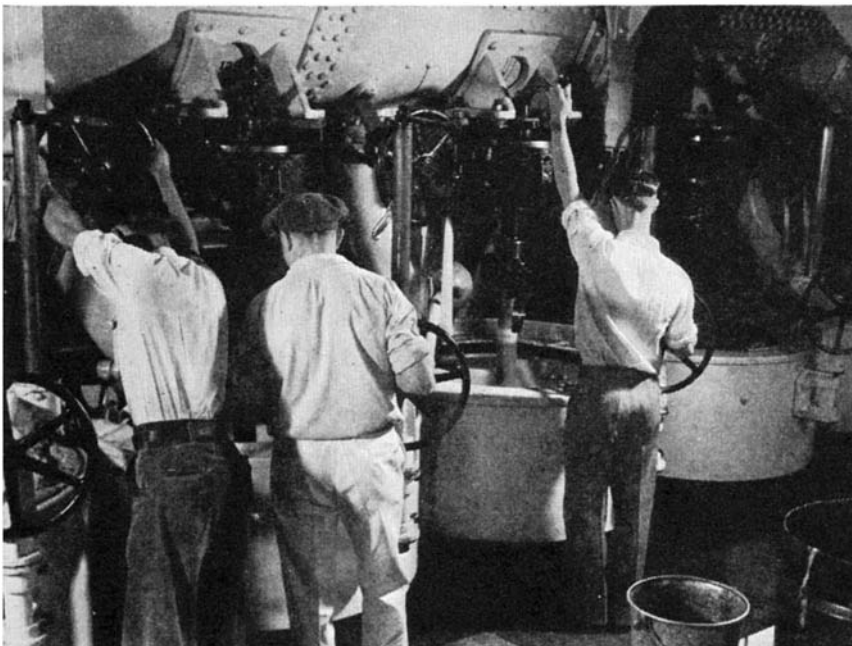
The liquid from the centrifugals is sent back through the mill and made into as much sugar as possible. The final liquor, or molasses, which remains after the second or third "running," still contains about 50 percent of "sweetening" and by a special process this can also be extracted.



Where the "run of the mill" is compared with standard samples for color and quality

Firmly rooted in the American soil, the beet sugar industry has been developed to a point where it could materially safeguard the nation against a sugar famine in case of war or tropical disaster. With present equipment it could provide in an emergency two fifths of the normal demand for sugar. However, because of falling commodity prices and the need for world-wide curtailment of production, the industry has been operated at only little more than half its present aggregate capacity and has concentrated on selling its product as close to the factory as possible.

COLORADO, California, Michigan, Nebraska, Utah, Idaho, Montana, and Wyoming are the leading beet sugar states. And while some beet sugar is produced as far east as Ohio, most of the sugar along our seaboards is refined by American mills from raw sugars from Cuba, the Philippines, Hawaii, and Porto Rico. Nearly all pure white refined sugar used in the United States is either home manufactured beet or American refined cane. The palm tree is a remote sucrose source as far as we are concerned. And while consumption has been falling off in the United States, latest reports from 12 countries in Europe show an increase in sugar use of 2.3 percent. This seems to be a problem for the economists. Perhaps Europe, where so many years have been spent in scientific development of the beet industry, understands the importance of a full sugar bowl in hard times. We would do well to follow their example.



The syrup containing crystallized sugar is discharged from the vacuum pans into tanks with stirrers which gradually cool it, effecting a retarded crystallization. At the proper point the crystallized syrup is passed into centrifugal machines

SEXUAL ABSTINENCE

AS A BIOLOGICAL QUESTION

Is Sexual Intercourse a Physiological Necessity?

By H. M. PARSHLEY, Sc.D.

THERE is perhaps no more essentially intimate and personal a question than this one which the editor has asked me to discuss in his public pages: Is sexual intercourse a physiological necessity? In the end it is a question that each must answer for himself or herself; for in a matter of such complexity, no mortal man, whether he be physician or priest, biologist or policeman, has the knowledge or the right to dictate to another. So my first reaction to the request was, I confess, a negative one. My tendency was to withdraw discreetly and move off in another direction, like the simple *Amoeba* or *Paramecium* confronted by some untoward feature of the environment. How, I thought, could one discuss profitably so intimate and delicate a question, one that has been so thunderously answered by arbitrary authority, and one, indeed, about which there is available no complete store of really scientific knowledge?

But these objections seemed to lose their force in the light of two considerations: (1) It is now possible to discuss such a question rationally, for perhaps the first time since pagan antiquity; and (2) For the first time in human history enough is known to afford the biological background necessary to balance the purely social forces of tradition, and thus permit intelligent personal decision. Let us, then, envisage first the biological background, and afterwards take up the specifically human aspects of the subject.

AS a member in good standing of the animal kingdom, the human species, *Homo sapiens*, is biologically equipped for sexual reproduction; that is, the species consists of two complementary types, male and female, so organized in structure, physiology, and psychology that through their equally indispensable sex activity offspring are produced and the species is continued. Thus man and woman have the anatomical and functional equipment that constitutes the reproductive system, an

THIS is a scientific journal and, as sex is a scientific subject, we shall discuss it from time to time (next month, for example) without inhibition, as we do other subjects.

The accompanying discussion is by a professor of zoology (author of "The Science of Human Reproduction: Biological Aspects of Sex" just published) who is regarded among men of science as an able authority on reproduction among living organisms. It deals with a special subject which is one of the most talked about, generally not any too scientifically, but, oddly enough, the least written about for the benefit of the same talkers. This seems peculiar. Man is the only animal which thinks of sex in a special light—either as something unnatural—something to avoid as not nice, or on the other hand to talk about in a way which makes it, in fact, not nice. Neither attitude seems quite sane or rational. Professor Parshley's article is simply a straightforward discussion of one of numerous very important subjects in life.

Some day man will regard the sex urge exactly as he does other biological functions—the equally natural urges to eat, to drink, and to breathe. When this kind of sanity finally arrives, a lot of undesirable kinks now existing in human nature will have vanished automatically.—*The Editor.*

elaborate set of glandular, muscular, circulatory, and nervous organs, which (though in certain minor details peculiar to the human species) are essentially like those of other mammals. It can be shown in minute detail how each part and each function in ourselves corresponds to parts and functions in the lower mammals; but for our present purposes this is quite unnecessary—no one with the slightest knowledge of the subject will attempt to deny this elemental similarity.

More to the point, perhaps, is the question of *behavior*. Granted that we have the standard mammalian anatomy and physiology, is our sex behavior likewise related to that of the animals? We are unquestionably peculiar among mammals in lacking all instincts (or inborn, hereditary action patterns) except the few shown in infancy—we are peculiar in having to develop individually the intelligence that depends upon learning, in being surrounded and

moulded by cultural influences as we grow up; but it is none the less true that in our sexual and reproductive behavior we retain the characteristics of our animal cousins in a degree that is not commonly recognized.

IN the first place, we must realize that the behavior of all animals, including man, is primarily motivated by three fundamental drives or urges, namely, *hunger*, *sex*, and *fear*, or—as we may put this ancient truth—the need for food, the desire for copulation, and the necessity for protection. These drives are not instincts in any true sense of the word. They are absolutely basic requirements of animal nature, inherent and necessary as primal characteristics of any continuing species. Without the first, the individual dies; without the second, the species becomes extinct; without the third, there is no possibility of seeking to satisfy the first two. I emphatically omit to mention those two ancient and imaginary "laws of nature," briefly represented by the terms, "self-preservation" and "race-preservation."

They are fictions of theorizers and thinkers. No animal, it is safe to say, and no man or woman ever thinks of them at the moment of absorption in food, sex, or danger. It is the biologically primal pleasure of taste, love, or escape that is in every case the moving force. That the satisfaction of the fundamental urges *results* in self-preservation and race-preservation is an intellectual observation, *ex post facto* and retrospective.

Thus we may expect to find that the compulsion to sex expression in the human species (as in others) is exceedingly powerful, and, indeed, almost or quite impossible to smother entirely—in normal individuals. And remember this: the urge of sex, inherent in the living organism as such, is *not*, at bottom, an "instinct of reproduction," a "creative urge," a "desire for offspring," or anything of the kind. It is simply the desire for sexual intercourse. This is one aspect of the scientific truth in

the matter, which must be accepted once we permit ourselves to look candidly for observational facts rather than for conventional formulations; and it must be taken into account in any sensible attempt to understand or regulate sex behavior.

Modern study of the mammals as a whole shows that the sex urge takes two main forms, which have been distinguished, especially by Briffault, as the *sex impulse* and the *mating impulse*. In the great majority of animals the mating impulse—the tendency toward more or less prolonged association of the sexes—does not exist; it is the sex impulse which is universal and manifests itself in the brief moment of sexual intercourse and in the often prolonged approach of courtship to that brief moment. Sudden separation commonly follows, when the powerful but short-lived sex impulse has found satisfaction. In all such cases, contrary to popular belief, the males dissociate themselves from the females until the next breeding season; and so the family consists of mother and offspring. Such a family lasts but a short time, as the young soon grow up and shift for themselves.

AMONG the primates (monkeys, apes, and man) very different relations obtain, the family consisting of father, mother, and offspring and having some degree of permanence. The reason for this is simple. To the mere sex impulse has been added the mating impulse; though, be it noted, the bare sex impulse remains in full force. While it is true that the biological significance of the primate family lies in the prolonged infancy of the offspring and the consequent need of the female for reliable protection and (in many cases) assistance, it would be a great mistake to suppose that the male assumes the rôle of constant mate and protector through the promptings of altruism and paternal affection. He is held simply because the primate female is ready for sexual intercourse at all times. Her readiness to accept his advances is not rigidly confined to brief and more or less widely separated periods of heat, as in the case in the lower mammals.

The mating impulse is thus seen to be in essence a means for ensuring the satisfaction of the more basic sex impulse. It is based upon a physiological peculiarity of the primate female and it is expressed in the tendency of the male to get one or more females for himself and to ward off as long as possible the efforts of other males to infringe upon his preserve. Whether such a family is monogamous or polygamous, a temporary arrangement or a life-long partnership, is a matter of little biological importance, depending upon all sorts of circumstances—the fortunes of war, the food supply, the species or race con-

cerned, and various geographical, ethnological, social, economic, and moral factors. The family as just described exists among the baboons (studied by Zuckerman) and, of course, in mankind; and from this level of organization it is no great step to such higher human manifestations as paternal and familial affection, romantic love, and all the various forms of marriage.

Before we leave the sub-human primates, we should take note of the fact that all the forms of sex expression observable in man (as Miller has pointed out) are practised by the apes or monkeys, excepting only prolonged monogamy and rape, and a few minor divagations like kleptomania (sex pleasure in stealing) and pyrolomania (excitement through setting fires), which are refinements rather beyond the mere anthropoid mentality. Not only playful, experimental, and ordinary adult sex behavior, but even such manifestations as homosexuality and autoeroticism (commonly called "abnormal" and ascribed to human depravity) are now known to be constant features of sex activity among the primates as a whole. It is only recently, through the studies of such biologists and psychologists as Zuckerman, Yerkes, and Bingham, that these extraordinary truths have come to light; whereas formerly the most we had was a dubious miscellany of hunters', travelers', and missionaries' reports, based on sparse records made at random and colored with whatever subjective prejudices these estimable but non-scientific romancers may have cherished as immutable convictions.

It is clear, then, that human sex behavior, no less than human sex anatomy and physiology, has an ancient biological basis, a traceable phylogeny or evolutionary history, that extends far down into the animal kingdom; and so it would be no less futile to attempt to understand and deal with sex expression as a purely human "problem," than it would be to take the same attitude toward important and obscure questions of structure, function, or disease in general.

IN turning now to the subject of sex expression in Western civilization, we must always keep in mind the fact that we are not peculiar beings, created *de novo* and set apart from the brutes, free from their compulsions and gifted with some infallible inner light that tells us what to do and how to do it. On the contrary, as we have seen, our behavior is at bottom motivated by the same biological forces and even in remarkable detail we share the sexual needs and mirror the sexual habits of our primate relatives. Immemorial failure to recognize this truth led to the erection of that senseless and oppressive

structure called Morality, which was triumphantly completed as the crowning glory of the Victorian Age, and which has been disintegrating since the close of that happy era. This so-called morality, we have at last come to see, meant no more than an effort to repress arbitrarily the sex impulse in certain classes of the population, particularly respectable women, public men (except royalty), and adolescents. For the rest, it was no more than a thin hypocrisy, more concerned to punish and to conceal, than it was to strengthen and elevate. It was especially notable for such institutions as prostitution, the double standard, the clinging vine, and censorship of art by civic officials; and while it no longer represents the ethics of the majority of intelligent people, many of its features persist as a cultural lag and every now and then give rise to ridiculous or dangerous phenomena. Among the first might be placed the advertising of books by local suppression; and among the second, the anti-contraception and breach of promise laws and the Mann Act.

All this lost the sanction of intelligence when once it began to be recognized that science, rather than taboo, dogma, and the mores, would have the last word regarding good behavior, and that sex expression (as apart from child-bearing) would come to be regarded as a purely private matter. As this view gains ascendancy, we may look for an ethics of freedom, responsibility, and knowledge to replace the morality of repression, dependence, and ignorance. Right will consist in natural and adequate expression, not in conformity; and wrong will be recognized as injury to others, not as "sin"—when this scientific attitude, combined with kindness, becomes predominant in human behavior.

WITH all these considerations in mind, we find ourselves prepared to answer the question with which we started, if, indeed, it still seems to be a question. With the exception of a few abnormal individuals, all men and women require expression of the sex impulse as a physiological necessity. No other answer is possible in the light of what we know about the anatomy, physiology, and fundamental biologic nature of mankind. Such expression, true enough, is not immediately necessary to individual survival—as are food and protection; but in consequence of the paramount importance of procreation in evolutionary history, the sex urge, through natural selection, is so deeply implanted in living beings, so involved with the physiology and the psychology of the individual as a whole, that its complete repression is impossible and any prolonged effort to

(Please turn to page 298)



THE SCIENTIFIC AMERICAN DIGEST

Conducted by F. D. Mc HUGH

Squaring the Circle Forever Impossible

SQUARING the circle—that is, constructing a square exactly equal in area to a given circle with no other instrument save straight-edge and compass—is one of the “impossibles” of mathematics. So said Professor Edward Kasner of Columbia University, in a radio talk given recently under the auspices of *Science Service*, over the network of the Columbia Broadcasting System.

“The squaring of a circle, in the way in which the problem is to be understood, is absolutely impossible,” he said. “It has never been done and it never will be done.”

Circle-squaring was one of the favorite undertakings of learned men in all times—ancient, medieval, and modern. Its very difficulty and believed impossibility served only as a greater lure. Close approximations could be made and have been made, but exact equivalents have never been achieved with the tools of classic geometry.

Until 1882 would-be circle-squarers had at least a moral right to keep on with their

Contributing Editors

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Similar proofs have been found that two other classic geometrical riddles can never be solved. These are doubling the cube and trisecting the angle. Doubling the cube, that is, constructing a cube of exactly twice the volume of an original model, cannot be done because the solution depends on finding the square root of 2, which is impossible to determine exactly. Some special angles can be trisected with ruler and compass, like an angle of 90 degrees, but no method of trisection good for all angles can ever be found.

Persons who continue to seek for these mathematical impossibilities, Professor Kasner indicated, are wasting their time and are not entitled to the serious attention of mathematicians.

Entirely new in principle, this thermometer will indicate the temperature “in the shade” by means of a neon-light column on each of the three faces of the tower. The neon tubes, coupled in sections representing one degree, will light up (or darken) progressively, as temperature changes are



The prism-sided tire which is said to banish “tennis-ball rebound”

endeavors, Professor Kasner explained, because nobody had ever brought forth conclusive mathematical proof that the feat could not be accomplished. But in that year a German mathematician named Lindemann formulated an involved but complete demonstration that the long-sought solution could never be found.

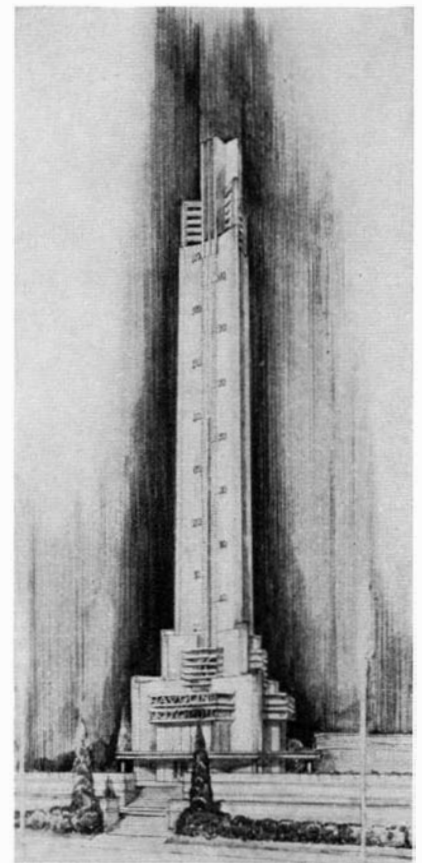
Rubber Prisms Improve Tires

“**L**AZY-RUBBER” riding ease is the tire industry’s latest contribution to soft-riding comfort and safety, according to tire engineers. This attainment, which is said to banish the “tennis-ball rebound” that is commonly associated with air under compression, has been achieved in the 1933 line of General blowout-proof dual balloons by the addition of “prismatic” sidewall construction. This new tire design is said to bring both structural strength and added beauty to distinguish these new tires.

By resisting the sudden recoil of air pressure after the tire has struck a bump or depression in the road surface, the sturdy mass of rubber prisms on the side walls snubs the return shock and gives the rubber sidewalls a lazy reaction or come-back.

Gigantic Thermometer

ATHERMOMETER 21 stories high, with a neon-light “mercury” column 150 feet long, 2½ feet wide, and marked by 10-foot numerals, will be a contribution to Chicago’s Century of Progress exposition. Erection of the “Temple of Temperature,” a tower of steel and sheet metal 218 feet high, started early in March, according to an announcement made by the sponsors, the Indian Refining Company.

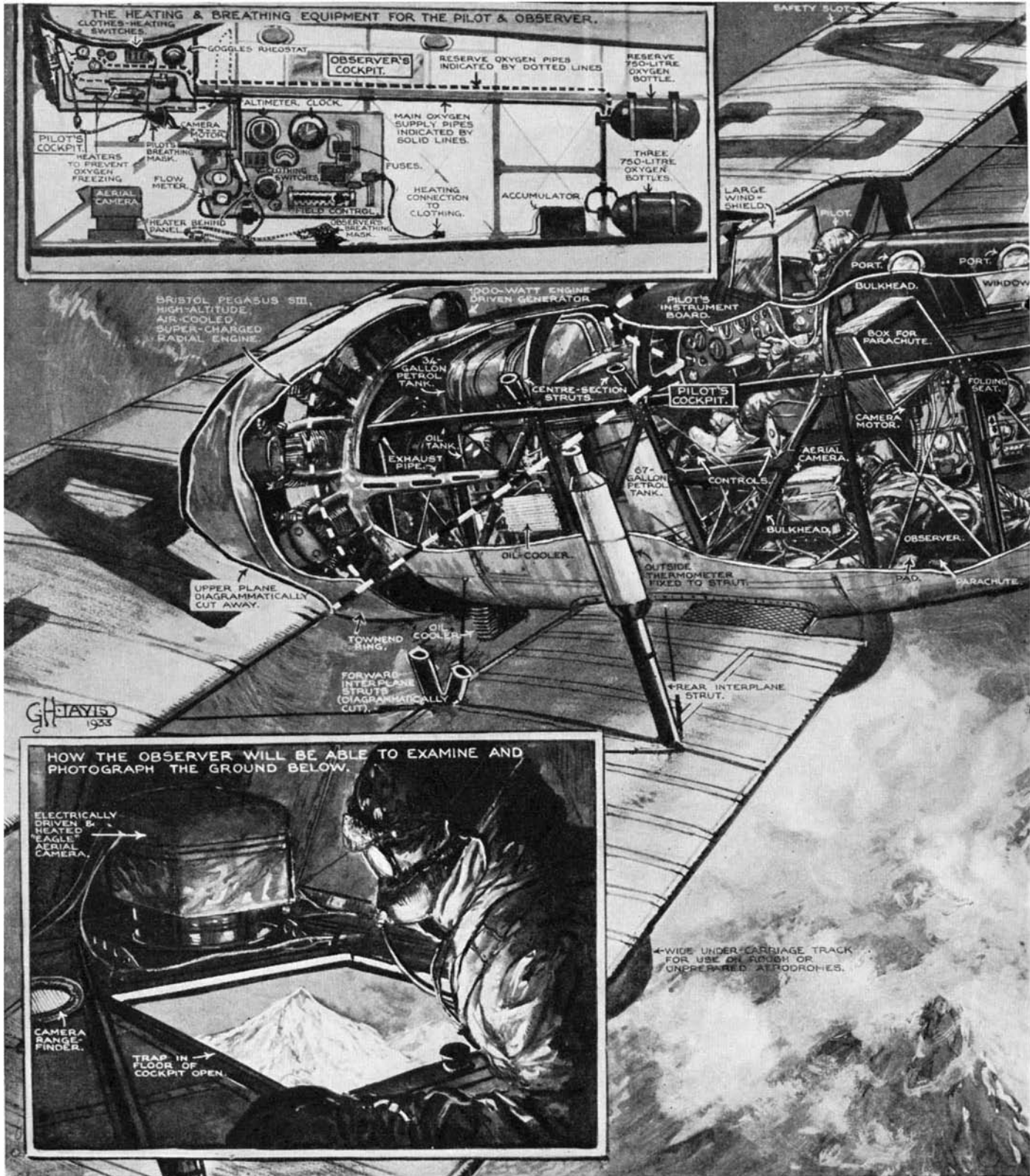


The gigantic thermometer tower

communicated to them electrically from a master thermometer. Temperature readings will be accurate within one degree and will be legible for great distances in every direction.

Heart Disease Pain

HOPE that the severest form of pain in heart disease can be generally relieved was held out at a recent meeting of the American College of Physicians. The hope was seen in new developments in the treatment of terrifying angina pectoris which were reported by Dr. James C. White of the



Courtesy The Illustrated London News

Details of the airplanes and equipment that have been prepared for the flight over Mount

Massachusetts General Hospital. Operations, in which certain nerves were cut, relieved the pain in six cases but one of the patients died because the operation was too great a strain for his diseased heart.

A safer method is injection of alcohol into the nerves, Dr. White found. In a series of 33 patients, more than half were entirely relieved of their pain by this method, while about one fourth were greatly improved and less than one fifth failed to secure satisfactory improvement. There were no deaths or serious complications

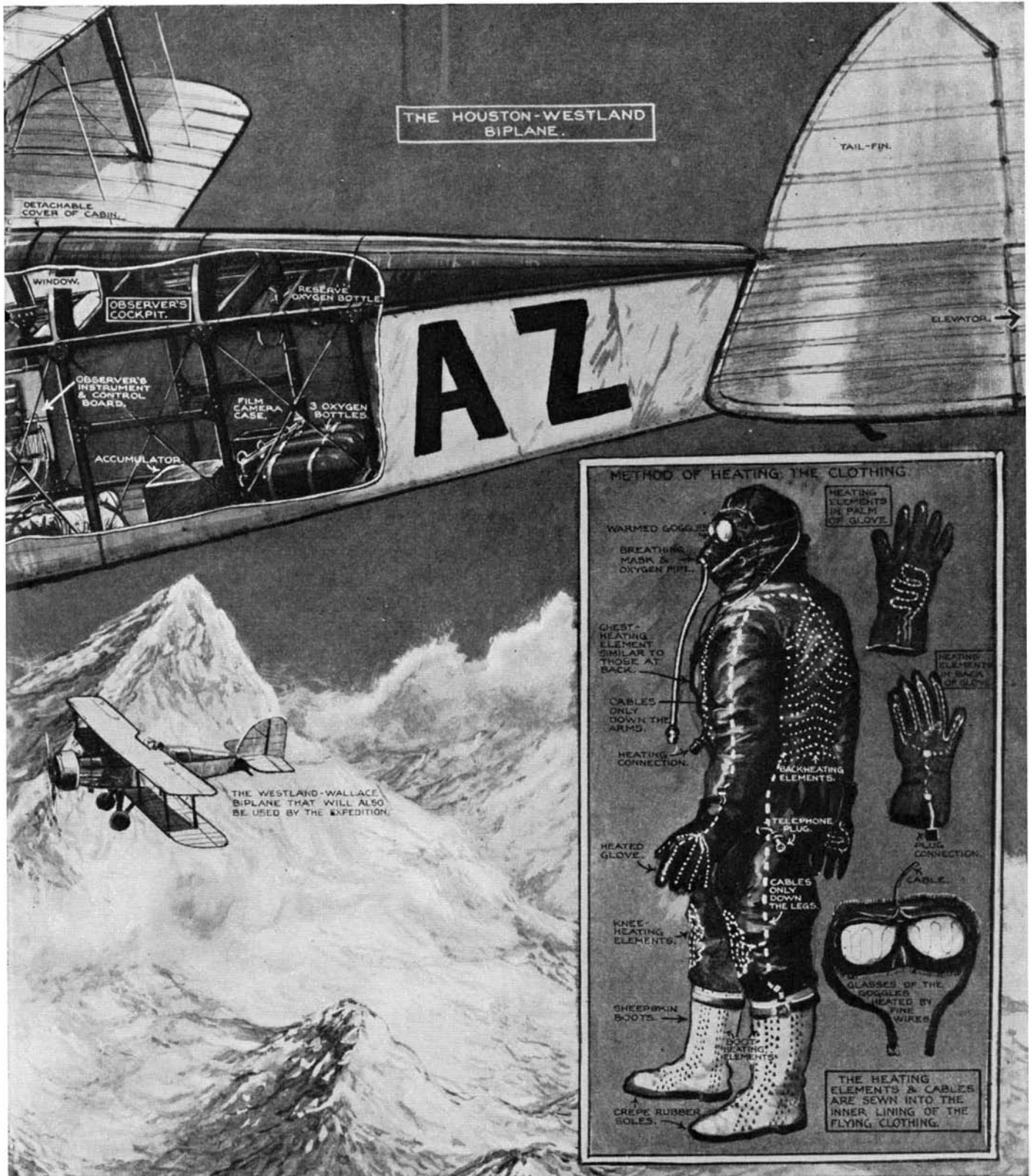
with this method of treatment. The chief drawback is the technical difficulty of injecting the alcohol accurately into the nerves. If this is not done properly, the results are not satisfactory.—*Science Service.*

Flying Over Mount Everest

The projected flight by British aviators over Mount Everest is much more of an undertaking even than flying over the North Pole. Intense cold, lack of oxygen, rugged

terrain in which it is impossible to alight without disaster, and loss of engine power in the thin air of high altitudes are the main difficulties to be overcome.

These difficulties are increased by the fact that the projected flight is not being undertaken just for the sake of a record. It is a scientific expedition which must return with many records and photographs. The scientific purposes add to the complexity of the equipment and to the weight of the equipment, and every bit of weight added to the airplane makes the attainment



Everest: electrical clothes-heating, oxygen-breathing apparatus, and the cameras for the flight

of high altitude all the more difficult.

The three main purposes of the expedition are: 1. To fly over and photograph Mount Everest. 2. To survey the immediate surroundings of the mountain. 3. To prove that the highest mountain in the world is not an insurmountable barrier to air transport.

If the flight succeeds in its second purpose the expedition will have done, in about three hours, work that would otherwise need years of patient, dangerous exploration which might still end in failure.

A base is being established for the expedition at Purnea airdrome in Bihar, India. From this base the plane will travel a distance of a hundred miles, by which time it will have reached a height of 25,000 feet. It is calculated that this distance will be covered and this altitude will be reached in 58 minutes. For the last 9000 feet of height, granted that there are no contrary winds, the two airplanes employed will need about 25 minutes. They will be at about 34,000 feet altitude in 83 minutes after leaving their base. Since Mount

Everest is only 29,141 feet high, ample altitude will be available for thorough photographing and surveying work. The amount of fuel carried will be sufficient to give the scientific workers 20 minutes of observation. This is considered ample time, but there will be none to waste. The drawings which appear here give a splendid visualization of both the plane and its special equipment.

One of the planes which is used in the expedition was originally built as an experimental military airplane and is equipped with a Pegasus nine-cylinder air-cooled en-

gine. The Houston-Westland machine and the Westland-Wallace plane (the other ship of the expedition), are perfectly conventional biplanes of about 46½ feet span, and 36 feet over-all length. The only change made in general design is that the tread of the landing gear has been widened somewhat to help landing in rough territory. The Pegasus S3 engine develops 580 horsepower at ground level. It is so equipped with a supercharger and an automatic pressure control that the power of the engine remains almost constant from ground level to high altitude.

It is not, however, in either plane or en-



Chamber in which oxygen equipment for Everest flight was tested

gine that the main interest of these ships lies, but in the arrangement of the cabin and of the equipment. The pilot will have his head exposed, but he will be protected by a large windshield, as can be seen from the drawings. The observer will occupy what is virtually an enclosed cockpit. Above the observer are placed two roof panels that fold inward and are fixed into protecting position after the observer has taken his place in the cockpit. The observer's covered compartment has two windows on each side, and a window in the floor. One window on each side and that on the floor have sliding panels, so that the moving picture camera may be trained directly on its objective.

The survey camera will be fixed in the floor of the fuselage immediately beneath the pilot's seat. The observer may reach forward to this camera from his cockpit, and his will be the duty of changing the film disks as they are used by the automatic camera. This task will have to be done quickly, and only one change during the whole flight is expected.

The survey camera is provided with a very elaborate heating system, thermostatically controlled. The men themselves will wear electrically heated clothing of cold-resisting and water-proof cloth, lined with kapok. From the artist's pictures we note that the heating elements and cables are sewn into the inner lining of the flying clothing, into the boots, gloves and helmets, and wire elements will even be led into the goggles. The heating of the goggles is most important, to prevent frosting.

The pilot and observer will have to be supplied with oxygen for at least half the journey. Accordingly, the oxygen apparatus constitutes an important part of the ship's

equipment. The main supply will be carried in three 750 liter cylinders. One man uses about 6 liters a minute at 30,000 feet, so that there will be enough oxygen even if the ship remains a full half hour above Mount Everest. There is also a reserve 750 liter tank. A primary oxygen supply is controlled by the pilot. The secondary supply can be controlled by either the pilot or the observer, so that should the pilot become incapacitated temporarily, the observer will be able to give him the extra oxygen needed.

The complexity of the equipment is not unlike that of a submarine. Camera motors, heaters to prevent oxygen freezing, clothes heating switches, camera heaters, all have to be packed in a close space, and much ingenuity has been employed in getting everything into the fuselage. A 1000-watt engine-driven generator will supply the necessary electrical current. This is not too large a power considering all the demands on the electrical supply.

Our readers will be convinced that everything that science and engineering can do has been done and, if the expedition fails, it will not be for want of thoroughness in preparation.—A. K.

Airlines Over the Pole

VILHJALMUR STEFANSSON is a great Arctic explorer, but an exceedingly modest one. He always disclaims being a hero or having undergone any extraordinary hardships in the Arctic regions.

Mr. Stefansson is definitely of the opinion that with proper precautions and preparations, life in the Arctic may be relatively pleasant, and flying within the Arctic Circle perfectly possible. At a fascinating lecture which the explorer recently delivered before the American Society of Mechanical En-

gineers, Mr. Stefansson took pains to explode certain erroneous ideas which have apparently been handed down to us from the ancient Greeks. The notion is prevalent that for at least half the year the Arctic regions are in darkness. As a matter of fact, for two thirds of the year the sun never sets at the North Pole, and it is only during one third of the year that there is night. What is more, snow and ice are such perfect reflectors of light, that there is never, at the North Pole, the absolute darkness which may prevail at the Equator.

Another popular fallacy is that the maximum of extreme cold is found at the North Pole; the maximum degree of cold has actually been found and recorded in the Province of Yakutsk in Siberia (1100 miles from the North Pole), where a temperature of 93 degrees below zero, Fahrenheit, has been found.

The Greeks also had a notion that everything grew smaller as we went farther North, and that finally life disappeared completely. Nothing could be further from the truth. Well above the Arctic Circle there are forests of trees that are more than a hundred feet high. The Eskimos are not perhaps as tall as Americans or Scotchmen, but they are quite up to the average of Italians and Frenchmen. The Arctic regions, far from showing no signs of life, teem with many varieties of birds, sea animals, and fish. The polar bear certainly is not a puny specimen of life. Still another exploded theory is that blizzards are more fierce at the Pole than anywhere else. Mr. Stefansson was of the opinion that the blizzards of Montana, North Dakota, and Manitoba are far more fierce than those of the Arctic.

Flying in the far north is not devoid of difficulties. Engines have to be artificially heated by the use of special stoves before they can be made to function. Let a me-



Courtesy The New York Times

Future international airlines will probably cross the polar regions

chanic touch a steel part of a cold engine with his bare hand and his fingers will be immediately frost-bitten and made useless for a long time. The pilot needs electrically heated clothing. Skis have to be very carefully designed, and sometimes a ship has to be provided with both landing gear and skis. On the Byrd Antarctic expedition a high-wing monoplane was a complete loss in a blizzard. To hold the machine down in the wind, it is necessary to dig into the snow or ice and place the skis in a sort of tunnel. From this point of view a low-wing monoplane is much better, since it can be more readily secured.

Gasoline is another problem and caches of fuel and oil have to be provided for explorers. The magnetic compass no longer serves to guide the flyer, because the needle is so erratic, and he can rely only on the sun and the sextant. Even with all the reliability of the modern airplane, the

bergh was perfectly right. Our notions of distances are very often based on maps in which distances are distorted. The accompanying map, where the observer is looking down from above the North Pole, shows interesting facts. The shortest way from the United States to China is over the Arctic region. The shortest way from San Francisco to England is not via New York and the North Atlantic, but across Canada, Greenland, Iceland, and the Faroe Islands. We must revise our notions of the shortest routes to other continents. When the United States is connected by regular airlines to China, Japan, Siberia, and Europe, it may well be that these airlines will all go near the Pole. Mankind is never daunted by difficulties, if a worthwhile objective is to be obtained, and plane designers, inventors, and airplane flyers and operators may eventually transform the wild regions of the north to a busy sea of aerial activity.

-A. K.

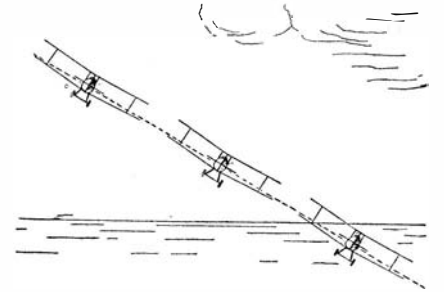
Flying in Formation

AN accompanying illustration is an official photograph of the United States Navy, showing a massed flight of seaplanes over Honolulu. The photograph shows a number of groups, each of three large flying boats flying in rather scattered formation. Such formation flying is beautiful to watch and essential in Navy maneuvers, and involves no hazards. When, however, the formations are really close, as is sometimes the case in Army and Navy work, both the hazards involved and the skill required are very much greater.

The training for correct formation flying is arduous and thorough. Antony Selwyn, a British Royal Air Force flying instructor writing under a pen name in *Air and Airways*, gives a few useful tips. In the first reproduced sketch, the formation is turning incorrectly. Each pilot is flying in the other's blind spot, the blind spot being formed by the upper wing of the biplane. In the second sketch, the formation is turning correctly, since the wings are no longer in the way and each pilot can observe completely the movements of the others.

This is a splendid illustration of what formation flyers must learn and faithfully observe.

We are told that in an orchestra each musician must never lose contact with the conductor's baton. A formation pilot must never allow his attention to be drawn away from the leader. He must fly at a constant distance from him whether banking, climbing, or diving. The formation flyer's con-



Formation turning correctly, each pilot being able to see the other

centration on his leader should be so great that he should never see the ground from takeoff to landing. Moreover, a formation pilot must know his leader and try to anticipate his movements rather than merely to follow them.

The intricate art of formation flying has been developed to a high degree by British pilots. We shall never forget watching a group of six British machines "waltzing" together to loudspeaker music and keeping perfect step with their guiding chief.—A. K.

Oxygen Powder

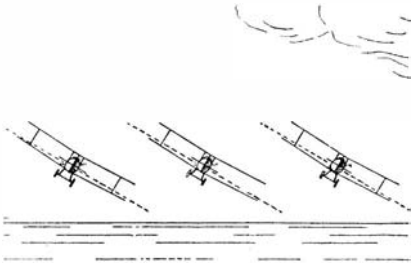
OXYGEN in powder form has been developed by German chemists and is being marketed under the name "Oxygal" by the I. G. Farbenindustrie. The powder is sold in air-tight drums and is said to keep almost indefinitely and to effect considerable savings in the cost of transportation where oxy-acetylene welding work is to be performed.

To convert the powder into gas it is only necessary to pour it into a horizontal retort and ignite it. Liberation of oxygen follows immediately, and one kilogram of powder produces about 300 liters of gas. The company has also perfected a portable oxygen producer in which gas can be produced under this method at a pressure of 15 atmospheres. The producer is equipped with two retorts, permitting uninterrupted production of oxygen.—A. E. B.

Heavy Water

A UNIT volume of water has long been regarded as having a definite weight, but Dr. E. M. Washburn of the U. S. Bureau of Standards demonstrated very clearly to the recent meeting of the American Association for the Advancement of Science that water may be as heavy as you make it. Two flasks of pure water, each containing exactly the same volume, were exhibited on a delicate balance, proving very conclusively that Dr. Washburn's water was heavier than any other pure water.

This phenomenon is due to the fact that the heavy water was made from heavy hydrogen—or, in chemical parlance, from the isotope of hydrogen that has an atomic mass about twice that of ordinary hydrogen. In nature one out of about 30,000 atoms of hydrogen is double weight. When water is

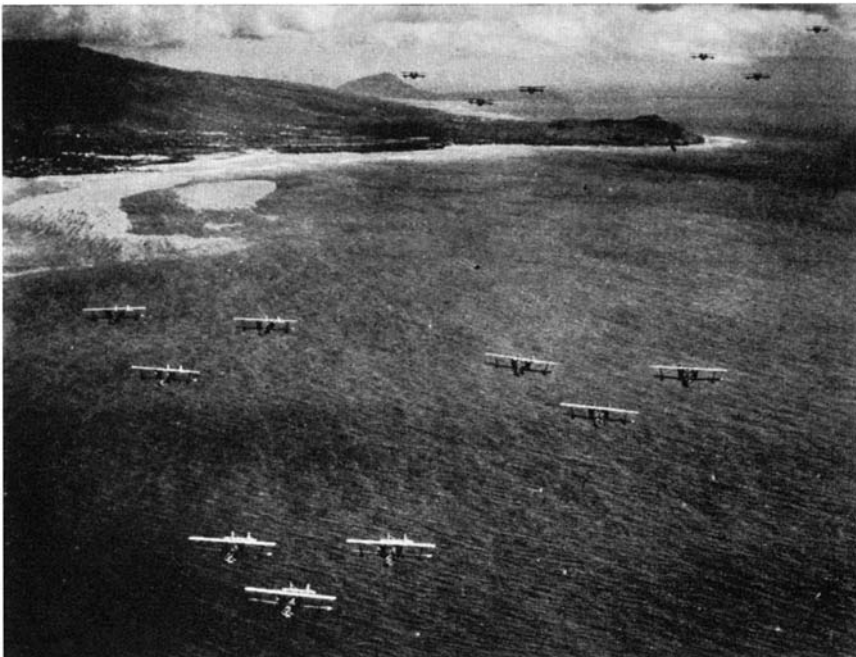


Plane formation turning incorrectly into each other's blind spots

hazards of alighting on broken ice are not pleasant to contemplate.

However, Mr. Stefansson thinks that all these difficulties can be overcome. He states that the interior of Greenland provides an almost flat territory suitable for airplane landings, and he is now engaged in careful studies, for Pan-American Airways, of possible routes over Greenland to Europe.

When Lindbergh flew to Japan, some newspaper comments had it that he was not flying the shortest route; that is, the Great Circle route from the West Coast to Japan. He flew across Canada and via Alaska and the Aleutian Islands. Lind-

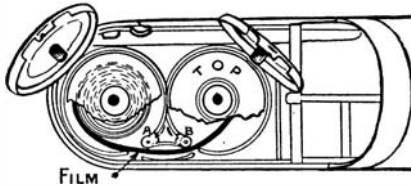


Official Photograph, U. S. Navy

A massed flight of Navy seaplanes over Honolulu

dissociated into hydrogen and oxygen by passing an electric current through it, the hydrogen given off contains more of the lighter hydrogen than normal. When this light hydrogen is burned it produces a water of lower specific gravity than the water of nature.

The water left in the electrolytic cells contains increasing amounts of heavy hydro-



The manner in which film spools are inserted in the new camera

gen as the electrolysis continues. In this way water that is one part in a thousand heavier than ordinary water was obtained.—A. E. B.

Fish Liver New Anemia Treatment

FISH livers have a new use—as treatment for pernicious anemia. This is announced by Professor L. S. P. Davidson, of the University of Aberdeen, in a report to the *British Medical Journal*.

Professor Davidson found that an extract from livers of cod, haddock, and whiting is effective in treating pernicious anemia. Beef liver is now widely used for this purpose.—*Science Service*.

Recover Camphor from Celluloid

WHEN Hollywood's "stupendous productions" have served their time in the theaters, the celluloid film may become a raw material for the production of camphor. German chemists have recently perfected a method for recovering camphor from waste celluloid which, it is claimed, retrieves 40 to 45 percent of the original camphor content. Patents on the process have been applied for in Germany and other principal industrial countries. The cost of reclaimed camphor is said to be about 20 cents a pound. The residue left after the extraction of camphor is said to be useful as a fertilizer. It is claimed that between 15,000 and 20,000 pounds of celluloid waste is available monthly in Germany.—A. E. B.

Lily Ponds, Gutters, and Soap

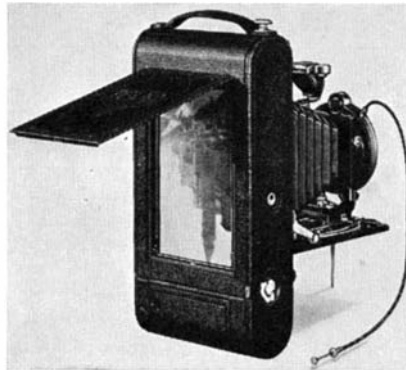
ELECTRIC soil-heating cable, announced some time ago by the General Electric Company, has been applied to a variety of purposes. The flexible lead-sheathed cable is used not only for hot beds, cold frames, propagating benches, germinators and other agricultural purposes, but also in many unexpected applications where a uniform distribution of a small amount of heat over a large area is desired.

Aquaria and lily ponds containing delicate tropical fish or rare plants that cannot withstand chilled water have been protected with lengths of the cable. Floors in buildings are being kept warm and dry. Other installations of the cable are supplying low heat to liquid products in pipe lines in factories. Industrial applications have also in-

cluded immersion heating for miscellaneous storage, treating and manufacturing processes in such varied places as glass, chemical, and soap factories. Incubators and brooders are being kept warm with the cable, thermostatically controlled; and down spouts and gutters of homes and other buildings are kept from being ice-clogged.

Ground-Glass Focusing Roll-Film Camera

CAMERA enthusiasts have long desired a camera that would combine the convenience of roll films and the advantages of ground glass focusing. Such a camera has been recently put on the market by Pal Ko Inc., of Chicago. A portrait or a scenic composition may be accurately focused on the ground glass of this camera, which is called the Pal Ko, the film then rolled into place by an ingenious shifting rod mechanism, the picture snapped, and the shifting rod



The roll-film, ground-glass focusing camera showing novel details

pushed back into place, this final operation opening the ground glass for further focusing and at the same time automatically winding the exposed section of film onto the "exposed" spool.

Another unique feature of Pal Ko is that which permits exposure of the full size picture, or a third, or two thirds of it at will. Since the camera takes postcard size film (3A), this feature allows a saving of film according to the subject photographed as one, two, or three pictures may be made in the space of one standard postcard "frame."

Accompanying illustrations show the camera with its elongated end, the method of inserting the full and empty spools in this end, and the shifting rod which operates the film. Both spools (A, the full one, and B, empty) are loaded with slotted ends down to engage the winding mechanism. A winding key is employed until No. 1 shows at the ruby window, and then the key is folded back and not used until a new roll is inserted. The shifting rod is engaged with the spools in such a way that when it is pulled out, it draws with it the empty spool, thus automatically unwinding film from the full spool and stretching the film directly in front of the ground glass ready to take the exposure. After the picture is taken, the rod is slowly pushed all the way in, this operation automatically winding the exposed film as the empty spool rolls back into its original position. The ground glass is now uncovered for its next job of focusing.

By pulling the shifting rod out only part of the way—one third or two thirds—there

will be a correspondingly smaller section of the film face exposed. An indicator beside the shifting rod shows the one third and two thirds points.

Radium Traces Poison in Bug's Body

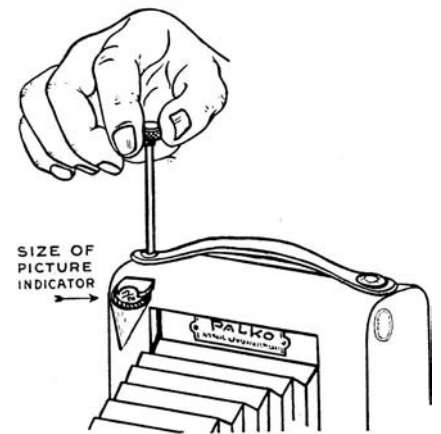
IN order to determine just how insect pests are killed by the lead arsenate commonly used as an insecticidal spray on fruit trees, Dr. David E. Fink of the United States Department of Agriculture devised a clever scheme. He wanted to trace the course of the poison through the insect's body. Remembering that lead has a strong affinity for radium, he mixed some radium solution with the lead arsenate spray and fed it, on leaves, to insects. After 24 hours, he killed the insects and sliced their bodies into very thin sections which he then placed on photographic film. Wherever the lead arsenate had gone, in the insect's body, a little radium had also gone. Therefore, since radium radiations affect a photographic film, the sections of insect photographed themselves, showing just where the poison had gone.

Dr. Fink found that every tissue in the bug's body received a share of the poison. He also discovered that the insect retains only about 10 percent of the poison it eats—but that's enough to keep Mr. Bug out of mischief.—A. E. B.

New Test for Drunken Drivers

CONSUMPTION of about one teaspoonful of alcohol can now be detected in an adult, as a result of improvement in technique in tests for alcohol in the blood, Dr. Klaus Hansen, professor of pharmacology at the University of Oslo, recently stated in discussing application of the new technique to tests for drunkenness in motor drivers.

The University Pharmacological Institute



Shifting rod of the Pal Ko

provides, free of charge to any doctor who asks for them, boxes containing tiny glass tubes, fitted with rubber caps, to hold the blood of motor drivers whose sobriety has been questioned by the police. The blood is taken from a prick in the lobe of the ear and is dispatched by post to the Pharmacological Institute for analysis.

Although this arrangement has existed only about 18 months, as many as 52 doctors in different parts of Norway have already taken advantage of it, and have sent 373 samples of blood to Oslo for analysis.

When the concentration of alcohol in the

Men who "know it all" are not invited to read this page

THIS page is not for the wise young man who is perfectly satisfied with himself and his business equipment.

It is a personal message to the man who realizes that business conditions have radically changed in the last few years, and that there is a whole new set of rules to be mastered. He feels that he ought to be earning several thousand dollars more a year, but simply lacks the confidence necessary to lay hold on one of the bigger places in business.

We should like to put into the hands of every such man a copy of a little book that contains the seeds of self-confidence. It is called "What an Executive Should Know" and it will be sent without obligation.

It contains the Announcement of the Institute's new Course and Service for men who want to become independent in the next five years. Among the contributors to this new Course are:

ALFRED P. SLOAN, JR., *President*, General Motors Corporation.

FREDERICK H. ECKER, *President*, Metropolitan Life Insurance Company.

HON. WILL H. HAYS, *President*, Motion Picture Producers and Distributors of America, formerly U. S. Postmaster General.

BRUCE BARTON, *Chairman of the Board*, Batten, Barton, Durstine & Osborn, Inc., Advertising Agents.

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Can any ambitious man fail to get something of value from contact with minds like these? Here are a few examples, selected from many hundreds, showing how this organized knowledge is translated into added earning power:

CASE 1. Works Engineer, salary \$6,000; now Vice-President and General Manager, salary \$18,000.

CASE 2. Local Manager at \$5,200; now Regional Manager, salary \$15,000.

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For the man who is perfectly content with himself and his job, the Alexander Hamilton Institute can do nothing. But there are thousands of men who could double their incomes if they believed in themselves and had the solid business knowledge to back up their belief.

Why not investigate *now*? The booklet pictured at the left costs nothing and places you under no obligation.

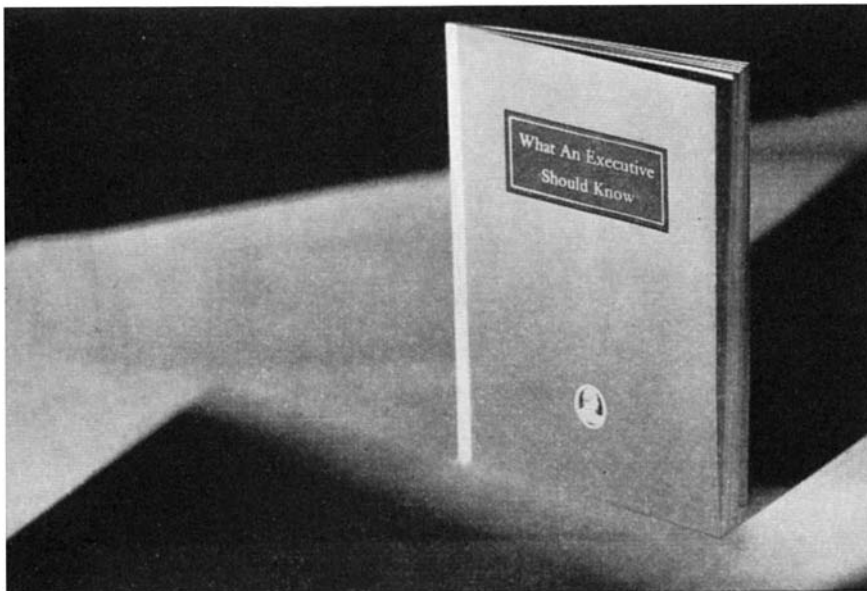
To the Alexander Hamilton Institute, 696 Astor Place, New York City. (In Canada, address Alexander Hamilton Institute, Ltd., C. P. R. Building, Toronto.)

Send me "What an Executive Should Know," which I may keep without charge.

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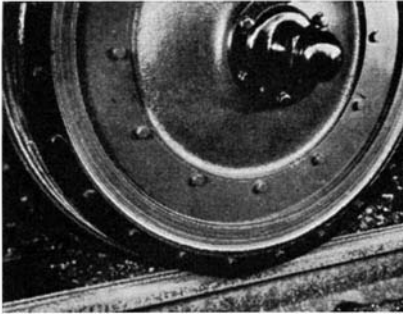
BUSINESS POSITION.....



For the Man who wants to be Independent in the next 5 years

THE little book pictured above should be read by every man who expects to win a secure place for himself in the next five years. It explains some of the changes which are taking place in the business world today. It tells

how you can equip yourself to take your place in the new business structure with confidence and increased earning power. It contains the condensed results of 20 years' experience in helping men to forge ahead financially.



The rubber-cushioned rail car wheel

blood was from 2.61 to 5 per thousand, the clinical report of the examining doctor invariably indicated drunkenness on the part of the driver. In such cases the analysis would seem to be superfluous.

On the other hand, it was invaluable at the other extreme, when it showed that the concentration of alcohol in the blood was so low that the driver could not possibly be under its influence, however excited and unreasonable his behavior might appear. Dr. Hansen refers to the case of a driver in whose blood the concentration was as low as 0.03 per thousand, a concentration of alcohol to be found in the blood even when a person has not drunk any alcohol. Yet, this man was so nervous at the time of the doctor's examination that he was assumed to be under the influence of alcohol. The doctor's analysis saved the driver from a most compromising situation.—*Science Service.*

Rubber Dishes

WHEN Hubby dries the dishes he will find one hazard eliminated if he uses the new tableware made out of Plioform, for this new kind of dish is made of rubber and a dropped dinner plate will merely bounce, without breaking. Plioform is a rubber-base product, developed by the Goodyear Tire and Rubber Company, from which dishes, kitchen appliances, and a wide range of molded goods can be manufactured at low cost. Available in a large variety of colors and types producing attractive mottled and opalescent effects, Plioform is entirely suitable for tableware, being tasteless and odorless and resistant to scratches. It is also unbreakable in the same sense as most high-grade plastics. Plioform also has qualities, such as resistance to hot water and discoloration by sunlight or age, which made it a superior molding compound for fabricating sundry novelties and gifts.

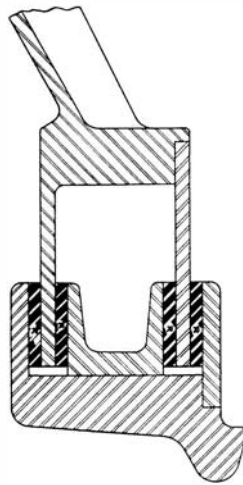
The new product is made of pure pale crepe rubber but, unlike any molding types of hard rubber, contains no sulfur and requires no vulcanization. In manufacture of the molding compound, the rubber is dissolved in a solvent and a chemical action allowed to take place which results in the formation of a white granular product, not unlike granulated sugar. This is the pure resin compound and, when molded as such, forms highly transparent articles of a light amber color. More often the pure resin is mixed with a filler and whatever pigment is desired and then milled. This results in a thorough dispersion of pigment, filler, and resin compound in solid form. This solid sheet is broken down into granulated form for molding.

In addition to the usual lines of kitchen

aids, sundry novelties, and laminated goods, the makers of Plioform compound have found excellent possibilities for it in the molded electrical parts field because of its fine non-conductive qualities, which make it especially suitable for parts, such as radio tube bases.—A. E. B.

Death Valley Proclaimed a National Monument

DEATH VALLEY in California was constituted a national monument and placed under the administration of the National Park Service by Presidential proclamation February 11, 1933. The new monument contains 1,601,800 acres, including the lowest point in the United States, 276 feet below sea level, and the greatest vertical rise in continental United States, Telescope Peak, 11,045 feet above the floor of the valley. Other features of the region are its geology and its rich plant life (nearly 500 species have been found there).



Section of rim of rail car wheel showing rubber cushion (dark shading) that supports entire weight

The valley was inhabited by a prehistoric race which left pictographs on the rocks; it was the scene of the struggles of the forty-niners and of later borax mining; it contains the "castle" of Death Valley Scotty, most famous of the prospectors, and is the home of the Panamint Indians.

The new national monument is accessible by road and rail and has facilities already available for visitors, including a modern hotel at the southern entrance and camp grounds located at a ranch just inside the valley.

Rubber-Cushioned Wheel for Rail Coaches

THE desire to rubberize railroad wheel equipment dates back over 50 years. Out of the chaos of many failures to solve the problem there has come a new type of cushion wheel, developed by engineers of the Clark Equipment Company of Battle Creek, Michigan, and The B. F. Goodrich Company, Akron, Ohio. It is now operating on the AutoTram of the Clark company.

In the AutoTram Cushion Wheels, multiple soft rubber inserts, adjacent to the outer circumference, are installed in a pre-loaded condition and carry the load, as well as traction or braking effort, entirely by shear distortion. These inserts are so disposed that all of the rubber in the wheel

carries its full share of the load at all times. The rubber in the upper half of the wheel supports as much load as the rubber in the lower half, thereby doubling the efficiency of the installation as compared with the many previous types of wheel where the load was supported only by compression of rubber in the lower half of the wheel.

Under shear loading of less than 10 pounds per square inch, these wheels easily support a load of 4200 pounds per wheel in the present installation and may be easily designed for loads up to 12,000 pounds per wheel or even higher. Here, for the first time, is a rubberized car wheel that offers but little limitation to total car weight as is the case with solid or pneumatic tires. The well known limitation of rubberized wheels is still present, however, in that braking effort may not be applied to the rims of the wheels. The high temperature developed by brake shoes quickly destroys any rubber in the wheels.

Totem Pole from Florida

WHEN the bald eagle was up for discussion as to its being placed on the seal of the United States, Benjamin Franklin opposed it and offered the American wild turkey as being more distinctly American than the Caesarean old hawk. The eagle won and was adopted on June 20, 1782 as an emblem for the great seal; it was also placed on the first coin issued by the United States, in 1765.

This same old bird has been held in reverence and superstitious regard as well as used in symbolism and heraldry, and depicted in all methods of art expression known to the North American aborigines back in prehistoric times. As one of the outstanding totemic animals, the eagle gave its name to many clans, tribes, and fraternities, religious and otherwise, in North America. Nearly every clan or gens had an eagle emblem at some period in its history—it was depicted on pottery, basketry, textiles, beadwork, quillwork, shields, crests, totem poles, house and grave posts, pipes, rattles, and nearly all objects pertaining to cult and ceremony of many old tribes.



Shavers: No more cut towels in the process of wiping the razor. With this device, it is only necessary to unscrew the razor slightly and slide it through as shown in order to clean and wipe the razor dry

The average person usually thinks of totem poles in connection with Alaska or the far north, yet the totem pictured here, a genuine eagle totem rudely shaped from heart pine, was unearthed in south Florida.

The specimen was found near the south bank of Fisheating Creek, about four miles on a line west of Lake Okeechobee. The exact spot where it was found is one hundred feet east of a large Indian mound called Fort Center, in Glades County, Florida. The totem was discovered by Mr. Melton Norton, of Lakeport, in 1926 in four feet of muck. It was later procured for the



Totem pole from Florida, probably the work of the Calusas. Parts of it have been restored by Florida Museum experts

Florida State Museum by Mr. T. Van Hunning, Director.

It is very evident that the specimen is quite ancient. It has been worked into shape by the use of fire and stone implements and it shows a charred surface under the weathering; unfortunately, however, when the Museum preparator cleaned it, he scraped away most of the evidence of fire in order to make it "look prettier." The head of the bird had split off and was not found, but the picture includes a restoration made in the Museum. The specimen is five feet, two inches high. It is probable that it was originally much taller, but as the end in the ground would rot off with age, it was probably re-set several times.

The specimen is probably best placed as the work of the Calusas, in 1600. The Calusa Confederacy of Indians occupied the territory from Lake Okeechobee to the Gulf of Mexico during the above period. There is a mention by Schoolcraft of the falcon flag under the great Muscogulge Confederacy that existed in Florida, but their territory was in the northwest part of the state.

Medicine Chest as Potential Danger

AS is well known, young children possess an unquenchable curiosity. The medicine chest has often been an accessible object of curiosity, with serious illness or death as the direct consequence.

The average medicine chest is likely to be quite overloaded. This is not only because of an unfortunate tendency to self-diagnose and self-treat, but also owing to the unwise accumulation of unused portions of medicines that have been prescribed by the physician during illness.

No more BUYING BACK THE FEDORA

We've abolished the restaurant check room tip

AGAIN STATLER HOTELS PIONEER

★ Think of it! No more tips to check room attendants at our public restaurants. We've banned these gratuities... *for once and for all.*

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These hotels have always tried to smooth the hotel patron's way. They were the *first* to bar gratuity-soliciting attendants in washrooms, the *first* to reduce news stand and cigar stand prices to street store scales. They were the *first* to introduce most of the features of the modern hotel.

You remember, of course... that it was the Statler Hotels that pioneered practically all the conveniences and comforts you demand today... a private bath with every room, free radio reception, etc., etc. The list of these Statler innovations is long... and is constantly being added to, as our spirit of service marches on.



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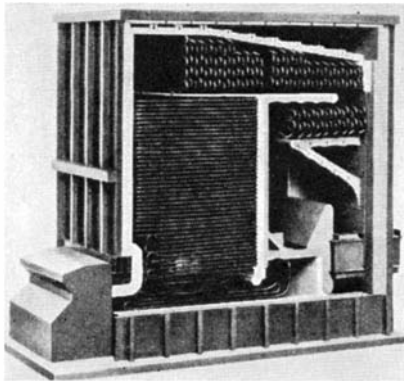
When young children are in the family, the medicine cabinet's stock should be limited to first aid requisites only, cautions Dr. Theodore B. Appel, Secretary of Health, Pennsylvania, writing in the *United States Daily*. Bichloride of mercury tablets, all kinds of sugar coated pills and medicinal liquids, should be made absolutely inaccessible to youngsters. A real hazard otherwise exists.

In addition to the risk of poisoning, is the likelihood that an overstocked cabinet will present a strong temptation to self-treat. Thus to usurp the function of the trained professional man is unsafe. Delayed treatment of the proper type has through this habit literally caused thousands of deaths each year in the United States.

From the standpoint of both child and adult, drugs are much safer in the drug store until actually prescribed by the physician.

Tube, 1½ Miles Long, Forms Boiler

EUROPEAN boiler design, in recent years, has been notable for radical departures from traditional designs. This has been particularly true in the field of high-pressure boilers, as exemplified by the Benson boiler, the Loeffler, the new Brown Boveri pressure-combustion steam generator, and others. To this rapidly expanding competition of new ideas, Sulzer Bros., Ltd., of Winterthur, Switzerland, has contrib-



Model of 1½-mile tube boiler

uted a new type of high-pressure single-tube generator.

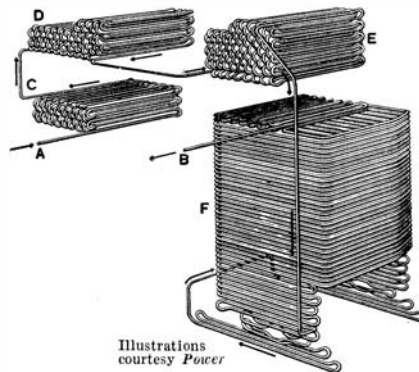
The following brief description is based on an article appearing in the January, 1933, *Sulzer Technical Review*.

The tube arrangement is clearly shown in the accompanying illustrations of the open-sided model and the tube model. It is understood that no full-size commercial boiler of this type has yet been constructed, but the principle has been sufficiently tested to result in orders for commercial units. One of the units ordered is a steam generator evaporating 18,000 pounds per hour; another will have a normal output of 40,000 pounds per hour. Both are to operate at 1400 pounds pressure. The larger steam generator is for a district heating plant.

It is stated that the single tube of a steam generator capable of evaporating 20,000 pounds per hour, will have a length of 1½ miles. Forced circulation is, of course, employed, the fluid being forced through the tube at a very high rate of speed. It is recommended that the boiler be operated with pure condensate.

Boiler drums are entirely eliminated.

This likewise eliminates a large amount of heat storage available in the ordinary boiler, and makes necessary very sensitive automatic regulating devices to keep the steam pressure and temperature approximately constant. Firing is also automatically regulated. The regulation so far employed provides for the injection of a cer-



Illustrations courtesy Power

Tube layout for the new boiler

tain amount of water at the entrance to the superheater to maintain a constant superheat temperature.—Power.

Rumor That Rays Stop Autos—Imagination

RECURRING rumors that rays that stop automobiles have been developed in Austria were set at rest when investigation by a *Science Service* correspondent traced the rumors to a newspaper article which scientists of Vienna declare to be absolutely fantastic and inaccurate. Viennese physicists corroborate the opinion of American scientists who declared the generation of such rays to be extremely improbable. Even if there did exist short waves that ionize air and thus prevented spark ignition of internal combustion engines, the engines of automobiles and airplanes would be protected against them because the rays could not in any case penetrate the metal of the engine cylinders.

Food Safely Left in Tin Cans

IS it safe to leave canned foods standing in a can after it has been opened? Many people have an idea that there is some mysterious and dangerous change that takes place when the contents of the can are exposed to the air, although they do not worry about the food as long as the can stands unopened on the pantry shelf. In answer to the many inquiries on this point, the Bureau of Home Economics of the United States Department of Agriculture has said repeatedly:

"Food is perfectly safe if left standing in a can under proper conditions of storage after the can is opened. In fact, the can is often the most convenient container in which to keep the food. Food spoils no faster and no slower in the open can than in any other open container. You can leave food in the can just as safely as you can leave it in a dish. But of course you have to use the same care to keep it cool and covered."

The bureau explains that some acid foods like fruit and tomatoes, when stored in an open can, do tend to dissolve iron. This may give the food a slightly metallic taste that is not harmful. If the label on the can advises removing the contents as soon as the

can is opened, it is because the canners think that an open can, partly filled with food, is not attractive in appearance.

Another wrong notion about canned foods is the idea that the liquid in a can of vegetables, like peas or beans, should be drained off and not used. Formerly this liquor was sometimes too salty, but not at present. That juice contains valuable nutrients, and discarding it is a distinct waste.

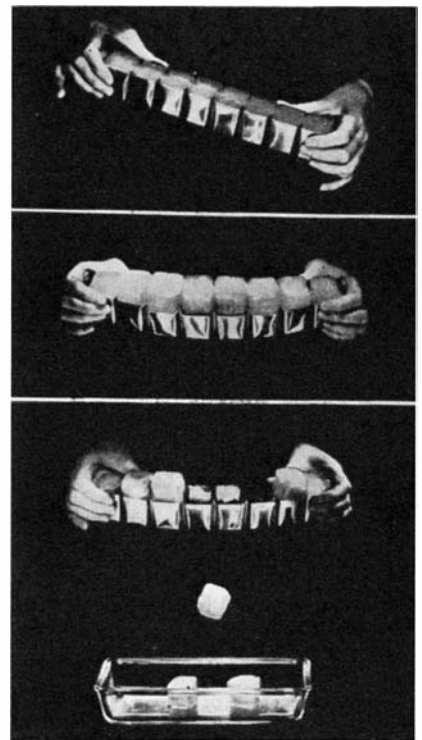
Stainless Steel "Accordion" Ice-Cube Tray

MECHANICAL refrigeration introduced a degree of convenience that had never been known before, the improvement being so great, perhaps, that the average person gave little thought to further refinement of the convenience. But the manufacturers of equipment have taken a different view.

There has been room for improvement, particularly in the manner of handling ice cubes, and now the McCord Radiator and Manufacturing Company has perfected a new ice cube tray that is highly practical because of the ease with which cubes are removed.

Instead of freezing ice by the trayful, the McCord unit produces cubes in individual rows. A trayful of cubes may consist of two, three, or four rows of cubes, each row handled separately.

You can pick out one of these sections of, say, six to nine cubes, give it a quick bend, and every cube will be broken loose. You can pick out one or more cubes or dump all of them by turning the section upside down.



The "accordion" ice-cube tray

It is not necessary to use water to loosen the cubes.

This method is possible because the tray is flexible. It is made of stainless steel, in one piece, so folded as to form an "accordion" kind of construction. It is easily bent or twisted, but the high quality of steel brings the section back to its normal shape, even after having been used many thousands of times.

CURRENT BULLETIN BRIEFS

PROFITABLE FARM MANAGEMENT AND SALE, by Cornelius J. Classen, is the third edition and has been considerably enlarged. The printing costs have been so reduced that it is now sold at a fraction of the former cost. *Farmers National Company, 388 Brandeis Theater Building, Omaha, Nebraska.—15 cents.*

THE SPERRY GYRO-STABILIZER is a detailed study on a most interesting subject. The new transatlantic liner *Conte di Savoia* has an elaborate system of stabilization where three Sperry Gyro-Stabilizers are installed. The results were most surprising. This pamphlet is beautifully prepared, and can be sent only to marine architects, owners of vessels, and others specially interested. Apply on printed stationery. *Sperry Gyroscope Company, Manhattan Bridge Plaza, Brooklyn, N. Y.—Gratis as above.*

WAR DEBTS—THEIR PRACTICAL ASPECTS (*Moody's Investment Survey, Vol. 24, No. 100, December 15, 1932*) discusses one of the complex problems which faces modern civilization. Over-shadowing all sides of this question is the simple practical side—the point of view of every-day interests of the average American business man, farmer, and wage-earner. It is to the consideration of this practical aspect of the involved war debt issue that this survey is devoted. A questionnaire method of arrangement is used for the sake of clarity. *Moody's Investors Service, 65 Broadway, New York City—Gratis.*

SEARS CLINIC OF HOUSEHOLD SERVICE describes an organized "back to quality" movement to teach intelligent buying. The pamphlet gives full information. *Sears Clinic of Household Science, 17 East Van Buren Street, Chicago, Illinois.—Gratis.*

ITALY AMERICA SOCIETY BULLETIN (January, 1933 Volume 1, No. 1) covers a most interesting field. It deals in a thoroughly adequate manner with the cultural things which Italy stands for. In the ten years of Fascist régime in Italy a whole series of great public works have been carried out which have substantially improved conditions throughout the country. The new magazine is a quarterly. *Italy America Society, 745 Fifth Ave., New York City—\$2.00 a year.*

PUMPING MACHINERY (Handbooks of the Science Museum Part I—Historical Notes), by G. F. Westcott B.A., is an exceedingly valuable treatise, one of the best, in fact, since Embank's *Hydraulics* which was first published in 1842. It is well illustrated. *Science Museum, South Kensington, London, England—2 shillings and 6 pence.*

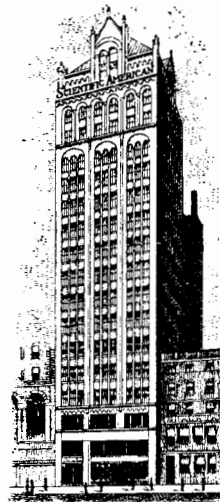
RECOMMENDED MINIMUM REQUIREMENTS FOR SMALL DWELLING CONSTRUCTION (Building and Housing Publication No. 18) is an exceedingly valuable revision of another pamphlet bearing the same title and issued in 1922. It is excellently illustrated. *Superintendent of Documents, Washington, D. C.—10 cents (coin).*

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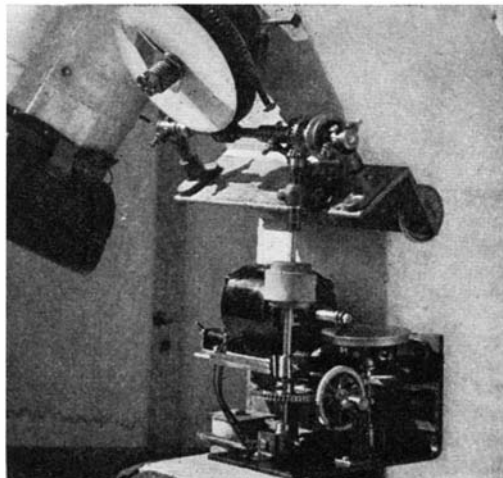
OVERLOOKING THE OCEAN

SEA WATER BATHS

THE AMATEUR ASTRONOMER

Conducted by ALBERT G. INGALLS

IN answer to our invitation, published in the March number, four short articles have thus far reached us—three on clock drives, one on graduating setting circles. More material on these subjects, especially if more general in scope though compact, is still wanted. Why be modest?



Lower's Telechron drive

J. V. McAdam, of Hastings-on-Hudson, New York, drew us a diagram of his drive, and this is reproduced on this page, accompanied by some compact notes which will be of value to other workers. He writes:

"G. E. motor, synchronous, K-4256047, 110 V., 60-cycle phonograph motor, 1800 r.p.m. with 2-to-46 reducing worm gear built in, making (M) turntable speed 76.26087 r.p.m.

1 sidereal day = 1 solar day less 3 m., 56.555 sec. = 1436.057 solar minutes.

1436.057 x 76.26087 = 112387.0702 revolutions of M per sidereal day.

Using three worm gear reductions of 91:1, 65:1, and 19:1 gives a reduction ratio of 112385:1—a difference of 2 revolutions out of 112387 per sidereal day, or about 1½ seconds. This is much closer than the power house cycle can be controlled.

The above worm reductions are not, however, standard. They may be obtained by using a combination of "change gears" and worm gears listed in gear catalogs and carried in stock, as follows:

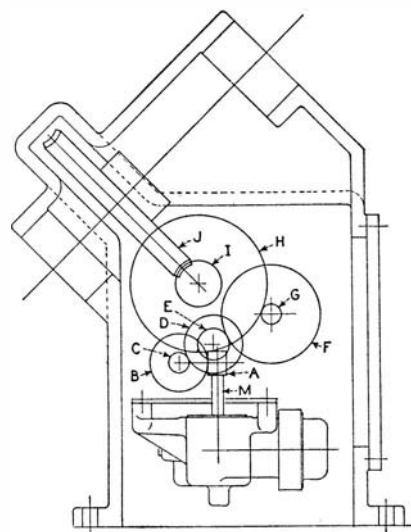
	Teeth	Diametral Pitch	Pitch Dia.	
{A	1	16	5/8	worm
{B	30	16	1 7/8	wheel
{C	12	20	6/10	spur
{D	38	20	1.9	spur
{E	20	20	1	spur
{F	65	20	3.25	spur
{G	12	20	6/10	spur
{H	91	20	4.55	spur
{I	1	8	1 1/2	worm
{J	48	8	6	wheel

Finally,

$$\frac{30}{1} \times \frac{38}{12} \times \frac{65}{20} \times \frac{91}{12} \times \frac{48}{1} = \frac{6743100}{60} = 112385$$

HAROLD A. LOWER, 1032 Pennsylvania St., San Diego, California, the author of the chapter on "Celestial Photography" in the new edition of the book "Amateur Telescope Making," sends in a close-up photograph of the clock drive on his 12-inch Cassegrainian (ATM p. 448) and writes:

"The speed regulation at the generating station is not all that could be desired. I have found that there are two systems in use for providing synchronized time: In one system the governors are controlled automatically by a master clock, and regulation is quite accurate. In the other system, the operator has to adjust the governor by hand whenever he notices that the synchronized clock is running away from the master clock. This means that the speed may be suddenly changed by as much as one cycle, causing the synchronized clock to run fast or slow until the difference between the two clocks is made up. Our variable ratio friction drive permits regulation of the speed at the telescope, and has worked out fairly well. [By "our," Lower refers to his father and himself, who cooperate.—Ed.] It also enables one to adjust the telescope to sidereal time without special gears, which are usually costly. The



McAdam's solution of the problem

gears used in our drive are all stock gears, which are easily obtainable. The only machine work which was required was in the making of the friction drive. The driving wheel is Bakelite. The driven disk is cast iron and must be accurately made. The surface of the disk should be ground and polished. A turned surface is too rough and will wear the Bakelite driving wheel quite rapidly. The motor is a 1/20 h.p. synchronous, and would have power enough for a 60-inch telescope. It is moved axially, that is, along the radius of the driven disk,

by means of a screw, to provide the speed control."

DR. SERGE A. KORFF, an astronomer at the Mount Wilson Observatory, writes:

"I have just built a small polar axis, the design of which might be of possible interest to amateur astronomers. On the tops of two upright two-by-fours are mounted bearings, which in turn carry the shaft of the polar axis. This shaft runs through the center of another piece of two-by-four (horizontal in the picture).

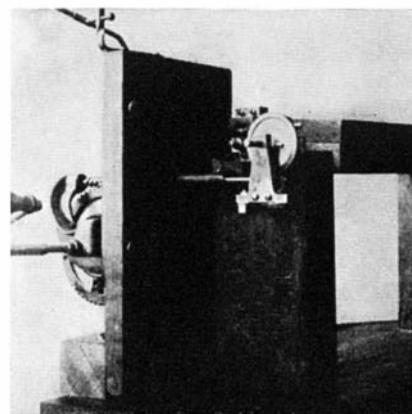


"Doc" Ryder sends us this master-piece and advises that, when graduating circles, stern measures must be taken to exclude the garrulous

The shaft is driven, through a set of worm drive reduction gears, by a phonograph motor. The speed control is visible on the upper left.

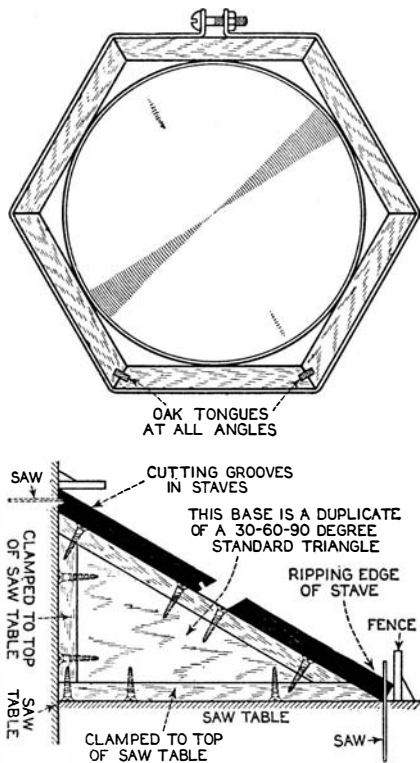
"The phonograph governor will allow the main drive shaft to rotate at one revolution per second; and consequently the gears were chosen to give a speed reduction of 3600 x 24:1. The governor speed is adjusted until the axis follows the diurnal rotation satisfactorily. Latitude adjustment is accomplished by raising the rear of the unit to the required amount.

"This polar axis was designed primarily to carry a small camera for eclipse cinematography but, by a small change in the speed of the driving motor, it can be adjusted for stellar, lunar, or planetary photography. It was especially intended to be portable. I am now planning to use it to carry cosmic ray counters, to assist in the study of the origin of these rays. By halving the speed of the drive, and mounting a mirror on the two-by-four, the arrangement may be converted into a heliostat."



The Korff phonograph drive

DR. E. N. RYDER of Croton Falls, New York, has quite accurately graduated a setting circle as follows: He obtained from one of the manufacturers of gears an iron spur gear of 9-inch pitch diameter, having 180 teeth, for about three dollars, and mounted this horizontally on a stand or table so that it would rotate on a vertical stub shaft. On top of the gear he attached a circular wooden table to hold the annular flat ring of sheet metal which was to be marked. Above this, on a separate



Charles Ingalls' method of making a neat, trim, accurate wooden tube

support, he mounted the marking tool, which was made from an old file ground to a point. This ran in a guide, in order to obtain marks of the desired length. The guide was provided with toothed steps, in order to permit making long marks of different lengths. To rotate the gear accurately he dug out of a junk pile an old screw which served (well enough) as a worm and, by rotating this worm through any desired part of a circle the trick was turned.

A HIGH-GRADE wooden tube of the Herschel type, similar to the ones shown in the March number, except that it is hexagonal instead of octagonal, can be made with a small, fine-toothed circular saw, as shown in the accompanying drawings. These are taken from some which have been sent us by Charles W. Ingalls, 368 North Hill Avenue, Pasadena, California, with whom we have been acquainted since about 4 A.M. on January 16, 1883. Make the triangles of the guide by very precisely copying in wood a 30-60-90-degree standard triangle, he advises. For the staves use about 3/4-inch stock. Groove the edges 3/16-inch wide and 1/4-inch deep and set the slip-tongues in white lead. In the second drawing two positions of the guide are combined in a single sketch, for convenience. That is, in order to obtain the other aspect, turn the magazine sidewise.

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SEXUAL ABSTINENCE AS A BIOLOGICAL QUESTION

(Continued from page 284)

repress it results in physiological injury and psychological disturbance¹.

I am aware that this assertion will be questioned and challenged, that it is not the statement which we are accustomed to hear from professional moralists; but I believe it to be the truth—the truth not only of modern scientific research but also of well-nigh universal human experience. The purely biological considerations that we have advanced constitute an almost irresistibly strong presumption in its favor; the vast and varied machinery of repression which has long been in action and is today beginning to break down, bears witness to the living strength of the deep-rooted urge that it would eradicate from humanity; and finally the views currently expressed in public or privately—by, so far as I know, all competent and disinterested students of psychiatry and the psychology of sex, are overwhelmingly in agreement with the statement I have made.

UNDER the officially accepted customs of our society, we are confronted with a serious problem of enforced abstinence from normal sexual relations, which involves continual direct conflict with the truth set forth above. I prefer to omit from present consideration the voluntary celibacy of adults, whether in or out of religious organizations—that is a special question that merits careful study on its own account. But we have beyond this (and far more important, socially) the question of adolescents, and of mature men and women who are unable to find mates of acceptable character for marriage. Concerning the latter, we can only suggest that their solution will be in sight when society accepts the view, already mentioned, that sex expression by adults, apart from child-bearing, is a private concern.

The case of adolescents is different, for a convention exists which strongly demands sexual abstinence during the more or less prolonged period of youth—from puberty to marriage. It would be difficult to invent a convention more directly opposed to biological realities than one—arising from artificial considerations of an economic and educational nature—which seeks to impose repression upon both the sex impulse and the mating impulse during a quarter or a third of the reproductive span of the individual. No such situation exists in savage society or among the simians, for promiscuity among the young, early marriage, and polygamy ordinarily afford a practically universal opportunity for the direct expression of the sex urge. It is impossible to suppose that such a scheme could be imposed with full success upon a biologically vigorous and healthy population; and, of course, success has not been achieved. Instead, we have had a system of polite and superficial evasion, a hypocritical assumption that all is well, a real but often unavowed acceptance of prosti-

¹The exact nature and extent of the injury depends upon many factors and belongs to the sphere of medicine. This subject has been dealt with by Näcke, Shufeldt, Robinson, Ellis, and many others; and it remains an important field of research.

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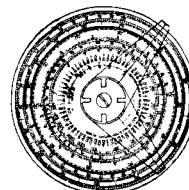
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tution—and a train of ruined lives. The obvious thing to do is to discard the whole scheme as unscientific and unethical, and to make such changes in the social order (no impossible or lengthy enterprise, as we now see in other spheres) as will permit of early marriage in some form. Otherwise the revolt of youth will go on—uncertain, unintelligent, unsafe.

But it is high time to listen to those who put their trust in "sublimation," those who, accepting the necessity for late marriage and widespread celibacy and at the same time wishing to enforce traditional morality, believe that in some way the primal biologic power of the sex impulse can be transformed into energy applicable to approved activities, such as artistic endeavor, humanitarian service, the pursuit of education, or the humble earning of a living. This possibility has long been regarded as a fact of nature, a common phenomenon of human psychology. One could hardly imagine a more remarkable example to illustrate what is meant by "a wise provision of nature" than this supposed faculty by which the human primate is adapted to the conventions of an artificial society.

Although psychoanalysts, Y.M.C.A. moral guides, Shaw, and R. C. Cabot unite for once in their acceptance of this principle, and it is a common teaching of modernist clergymen, yet Freud himself said that it is "for the few," and various psychologists view it with suspicion. Fortunately, a very recent study by Professor W. S. Taylor supplies just the scientific information on this question that has been lacking. His results show that "sublimation" does not take the place of direct sex expression, even in high-minded persons of well-rounded interests, well educated, successful in their work (graduate study), properly aware of the moral value of chastity, and determined to dedicate all their strength to the pursuit of worthy ends.

WITH every conceivable care to avoid any form of error or misrepresentation (for details the original must be consulted), and without appreciable bias, the investigator carried out a clean-cut research which will go far to settle this ancient question. He found that every man made an "adjustment" that involved orgasm in dreams, autoeroticism, extreme petting, or irregular sex relations with women. Only seven out of forty confined themselves to dreams. And these adjustments were arrived at, often, only at the cost of intense struggle with "the problem."

There is here no evidence whatever of a transformation or "sublimation" of sexual energy; indeed, Taylor states that "the whole conception [of sublimation] is bound up with a misleading metaphysical-psychological theory." There is, in fact, no evidence for the existence of "a common psychophysical energy which can be diverted into different channels." There is, to be sure, no doubt whatever that a serious purpose in life, healthful activity, philosophic insight, and moral inhibitions may often tend to restrict sex activity. Such agencies simply engage the attention and so prevent the individual from building up for himself a habitual degree of sex activity higher than that represented by the sex urge alone. But this remains unchanged, recurrent, and inescapable. In women the

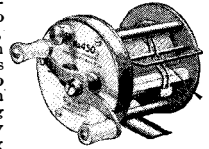
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sex physiology is somewhat different from that of men, so that unless awakening occurs the sex impulse may remain obscure, diffuse, sometimes not recognized as such at all; but it is there, and if denied normal expression it ultimately causes harm in one way or another.

The truth is that the sex impulse is very rarely refused some form of expression; genuine sexual abstinence is excessively infrequent, probably non-existent—in normal individuals. At the end, then, we come to the question which society, probably in the near future, will have to face. What form of sex expression is best and most acceptable from every point of view? Scientific research will tell us, negatively, which forms are injurious, illusory, or inadequate; but I venture to suggest that the question has already been answered, positively, by human experience. Sexual intercourse between persons who love each other is necessary for physical and mental health. This alone can fully satisfy at once the biological demands of our primate bodies and the psychological requirements of our human minds.

OUR THIRD-RATE NAVY COULD NOT FIGHT JAPAN

(Continued from page 271)

cruisers. In 1927, President Coolidge having been finally convinced of the Navy's needs, signed a bill authorizing construction of 15 eight-inch gun cruisers. This was helpful but still not enough.

In the spring of 1930, the London Conference was called to consider limitation of categories not previously limited. Japan had built so purposefully—and we had built so little—that she was able at that Conference to demand, *and get*, a higher ratio in cruisers and destroyers, and parity with Great Britain and the United States in submarines.

In forcing its demands at the London Conference, the Japanese War Party once again showed its colors. That Party has set its eyes on one goal—the absolute domination of the western Pacific—and apparently nothing short of a war with the great powers can prevent this result. Our show of force in the Pacific last year may have caused hesitation at Shanghai, but the time is rapidly approaching when the military masters of Japan will have more confidence in their power than they had. When that time arrives, a war which will inevitably be a world war on a grand scale, will decimate millions upon millions of people.

Our duty is therefore clear—and it is a duty not only to ourselves but to world peace; we must prevent that war! To do this, it is necessary that we initiate a naval building program that is both far-sighted and large enough to quench the flame that is spreading through the Orient. We must adopt "fierce-face" tactics—the only kind which Japan seems to understand. If we do not, Japan will dictate the terms of whatever further agreement may be made as to the limitation of armaments after the London agreement runs out in 1936; and most assuredly those terms will render Japan supreme!

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obligations. As the situation stands at present, an American war with Japan would be long-drawn out, extremely costly, and indecisive. Our lack of naval bases in the western Pacific and Japan's proximity both to numerous bases and to our possessions and the possessions of others, our very long and exposed line of communications for both munitions and supplies, and our relatively weak Navy could lead to no other result. At present, our combat strength on the water—vessels afloat and in condition for immediate service—is below that of both Great Britain and Japan. If war should be forced upon us, we would be faced with the necessity for a period of feverish naval construction. Should our present force be able to defend us for 18 months, we would after that time possess sufficient naval strength to sway the war in our favor. Our tremendous power of organization and manufacture would then enable us to produce war material so rapidly that we need fear no nation. It must be emphasized, however, that because we are in no position right now to fight a first-class naval power, we might be vanquished before the 18 months' preparation could be completed, and that, in any case, there would be a needless slaughter of men, to say nothing of the enormous cost in money.

Without confusing ourselves with detailed statistics, it may be noted that while the authorized treaty strength over-all for the United States, Great Britain, and Japan is 10 to 10.1 to 6.4 respectively, Japan and Great Britain have built toward that treaty strength so much more than we have that at the end of the London Treaty on December 31, 1936, the ratio will be: Great Britain 13.2, Japan 12, and the United States 10 (under-age tonnage of all types of combatant auxiliaries, built, building, and appropriated for as of January 1, 1933). And a large percentage of the combat ships on our list will be very near obsolescence! This is indeed a poor showing for a nation which, in 1922, believed it could disarm the world by agreement and by example. The example did not work and we ignore the agreements we have made.

We repeat: Our duty is clear. It is realized that, for reasons of economy, little can be spent upon naval building at present. A far-sighted plan, however, would stretch the cost over such a period of years that the annual cost would be insignificant compared with the security and commerce protection a planned treaty navy would afford, even though that treaty navy might never be actually completed. Furthermore, as we have said in previous articles, since 80 to 90 percent of the cost of constructing a naval vessel goes for labor in numerous industries all over the country, there could be no more important way of putting thousands of our unemployed to work. National security is more important than highways or public buildings!

NATIONAL security! We who have experienced the realities and horrors of modern war know the importance of that term. We do *not* want another war, but we face facts squarely. If the militarists of Japan—or of any other nation, for that matter—want to force war upon us, the strength of our Navy must be such as to discourage all actual attempts to do so!

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COMMERCIAL PROPERTY NEWS

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Commissioner Asks For Reduced Patent Fees

IN his annual report to the Secretary of Commerce, Commissioner of Patents Thomas E. Robertson outlined the excellent work that has been done by the Patent Office during the year 1932, and made a plea for a reduction in the fees now required. The part of the report that pertains to this particular subject is reprinted below:

"Owing to the decrease in the number of new applications received and the consequent loss of fees, the financial receipts of the office for the first time in years have fallen below that of the preceding year, or from \$4,565,377.08 to \$4,487,508.78 (\$4,540,706.67 including sales of Official Gazette). For the past 10 years the receipts of the office from fees have increased each succeeding year. I therefore urge that at the end of this year the fees be reduced. The increase in expenditures this year has been largely owing to increased payments for printing, these costs advancing from \$1,067,825 for the previous year to \$1,410,280, an increase of \$343,000. To this greater expenditure should be added the cost of the new steel stacks, et cetera, installed in the new building, which amounted to \$108,000. Because of these greater expenses, the temporarily reduced income, and the reduction of arrearage from previous years the excess of expenditures over receipts has been \$774,144.92, as compared with \$266,900.88 in 1931."

"Pinetex" versus "Pinex"

IN the case of *Noll v. Krembs*, First Assistant Commissioner Kinnan held that Walter R. Krembs (doing business as Pinetex Company), of Chicago, Illinois, is entitled to register, as a trademark for medicated textile for the treatment of hair and scalp, a mark consisting of a rectangular background with the notation "Pinetex" thereupon and beneath the latter the representation of the head of a girl in the act of using applicant's medicated textile in the treatment of hair and scalp, notwithstanding the prior adoption and use by William H. Noll (doing business as The Pinex Company), of Ft. Wayne, Indiana, of the term "Pinex" as a trademark for medicinal preparations for coughs, colds, and so on. The ground of the decision is that the goods of the respective parties are not of the same descriptive properties.

In his decision, after noting that the opposer had cited a number of decisions which he argued were persuasive of probable confusion in trade, the First Assistant Commissioner said:

"There is no contention that the applicant has used its mark upon any goods other than those set forth in his application nor that the opposer has used his mark upon goods other than those internal

MR. LIDDY will be pleased to answer the inquiries of our readers who may desire information relative to the various subjects reported in his department.
—The Editor.

remedies set forth in his notice of opposition. A medicated cloth to be applied to the hair and scalp seems to be so foreign in character, properties, and use to a cough remedy put up in a bottle that confusion in trade would be practically impossible."

Patentable Combinations

A NEW combination of old elements, whereby a new and useful result is produced, or an old result is attained in a more facile, economical, and efficient way, may be protected by patent as securely as a new machine or composition of matter. *Seymour v. Osborne*, 11 Wall. 516, 542, 548, 20 L. Ed. 33; *Gould v. Rees*, 15 Wall. 187, 189, 21 L. Ed. 39.

"Staybind" Not Registrable

IN a recent decision, First Assistant Commissioner Kinnan held that A. E. Staley Manufacturing Company, of Decatur, Illinois, is not entitled to register, under the Act of 1905, as a trademark for combining paste, the notation, "Staybind." The ground of the decision is that the notation is merely descriptive of the goods.

In his decision, after stating that the mark is used on adhesive for combining plies of paper and other articles, and noting applicant's argument that the mark is made up of the first three letters of the name "Staley" and that a number of other trademarks have been registered which embodied those three letters, and the further argument that the word "bind" cannot be construed as meaning "bound", the First Assistant Commissioner said:

"It must be deemed the notation, when applied to an adhesive for holding together plies of paper, would merely mean to purchasers that the adhesive will so bind the plies of paper that they would stay together. To those purchasers who were not familiar with the applicant and its business the notation would merely mean that the adhesive was of the character that would hold together the paper. To such parties the notation would be construed as 'Staybound'."

Design Drawings

THE Patent Office is now willing to accept in lieu of India ink drawings photographs—not photostats—of designs in textile design applications, provided such photographs are printed on Bristol board of the standard size and that the prints so made are properly developed, fixed and

thoroughly washed so that they will not fade. The blacks must be pure black on the prints and the whites pure whites. The middle tones should be interpreted by sharp dots of intense black. In the case of shaded color designs, the following should be the process for making the prints:

A negative is made on a panchromatic dry plate through a suitable filter to bring out the various shades in the design. From this negative a half-tone screen positive is made by the wet plate process, the ruling of the screen to be 65 lines per inch. From this positive a negative is made in film by contact printing in a vacuum frame, from which negative the finished print on Bristol board is made.—*Journal of the Patent Office Society*.

Tube Comparator Patented

A NEW device that registers both aurally and visually the relative signal response of thermionic tubes, such as those used in radio receiving and transmitting sets, amplifiers, talking pictures and telephone apparatus, while they are in actual operation, has been patented by Dale Taylor, manager of station WESG, Elmira, New York. He calls the device a tube comparator. Its chief value lies in the fact that it demonstrates the comparative suitability of tubes during actual operation in a circuit.

Foreign Interest In Puzzles Noted

THE jig saw puzzle which is becoming increasingly popular in the United States is taking hold in foreign countries, and probably will result in the development of an export business in American-made puzzles, according to Miss B. C. Merdian of the Commerce Department's Specialties Division.

Requests for information on American-made jig saw puzzles have been received from foreign firms through the Department's representatives in Oslo, Norway; London, England; and Toronto, Canada. American manufacturers have been advised of these requests for information.

Since exports of jig saw puzzles from the United States are not classified separately, the value of the current trade is not known.

New Standard for Fuel Oils

THE revised Commercial Standard for Fuel Oils, sent out under date of Dec. 5, 1932, has been accepted by a satisfactory majority of oil refiners, distributors, and consumers, as well as many of the oil burner manufacturers, the Department of Commerce has just announced.

The standard, which is identified as CS12-33, is to be considered effective beginning May 1, 1933, it was stated.

Books SELECTED BY THE EDITORS

MODERN PHYSICS

By *G. E. M. Jauncey, Prof. Phys., Wash. Univ.*

THIS is a new textbook of modern (i.e., mainly atomic) physics by a former editor of the *Physical Review* and it presupposes full completion of a first course in college physics—also a knowledge of algebra, geometry, trigonometry and calculus. (It is true, this book also contains a special chapter on calculus, intended to bring those who lack it up to the required level, but only a reader with a tough will can expect to whip calculus when working alone.) The text space is about one third mathematical, is compact and concise, wastes no words, and covers a great deal of territory in that manner. The chapter headings are: Alternating Currents; Electro-magnetic Theory of Radiation; Properties of Moving Charged Bodies; The Electron; Kinetic Theory of Gases; Thermionics; Photoelectric Effect; X rays; Bohr Theory of Spectra; Periodic Law and Atomic Structure; Critical Potentials; *Radio and Television*; Radioactivity and Isotopes; *Geophysics*; *Astrophysics*; Relativity; Specific Heats; Electrical Resistance; *High Frequency Sound Waves*; *Recent Ideas in Physics* (de Broglie waves, Heisenberg principle, freedom of will, causation). The chapters italicised represent new features in a standard textbook and are typical of the whole book—that is, it is as “modern” as its title suggests—\$4.20 postpaid.—*A. G. I.*

THE PRINCIPLES OF OPTICS

By *Arthur C. Hardy, Assoc. Prof. Optics, M.I.T. and Fred H. Perrin, Dept. Physics, M.I.T.*

HERE is a book! Amateur telescope makers who aspire to know the general background in all-around optics (and which of them does not?) will find it all, or very largely, right here in the 618 text pages of good solid meat of this remarkable treatise. In it there are 29 chapters, which we may divide into two groups. The first group of six chapters deals with optical theory and these will provide good hard plugging through 120 solid pages of basic stuff, but the worker who really whips them will then really “know something” about optics. These chapters center around image formation, dealing specifically with: general concepts; refraction at a spherical surface (ray tracing, and so

on); thin lens theory; theory of lens systems; aperture theory; lens aberration theory. Having thus acquired an advanced amateur’s knowledge of the principles of theoretical optics, the reader will next discover that the remaining 23 chapters (498 pages) of this book deal with applied optics or optical engineering, respectively as follows: resolving power; radiation; light sources; the eye; photography; light-sensitive cells; photometry; color; optical glass; manufacture of optical parts; testing of optical parts; miscellaneous optical materials; design of optical instruments; ophthalmic instruments; photographic objectives; magnifiers and oculars; telescopes; microscopes; stereoscopy; projection systems; spectroscopic apparatus; interferometers; applications of polarized light. This textbook is used by the authors in teaching optical engineering at the Massachusetts Institute of Technology and it contains a whole world of fact. It is not very mathematical—perhaps 25 percent so—and the mathematics used are only algebra, with a little “trig” and a very little calculus. The reader who absorbs the contents of this 618-page book (6” x 9” x 1¼”) will have a pretty sound all-around knowledge of optics, both theoretical and practical.—\$6.20 postpaid.—*A. G. I.*

THE EXPANDING UNIVERSE

By *Sir Arthur Eddington, Prof. Astron., Cambridge Univ.*

NOW comes another brilliant popular book by the noted author of “The Nature of the Physical World,” himself one of the world’s greatest scientists, covering all the most recent theories of the universe. The world’s most famous mathematical cosmologists, Einstein, de Sitter, Eddington, Jeans, Lemaître and others, are at present focusing their attention on the leading problem of science, that of the expanding universe (which is really the problem of the nature of the universe). At present this great work is only in the “roughing-out” stage; the workers make guesses (perhaps, however, they are better equipped “guessers” than most of us), test these guesses mathematically, and in the meantime hope for more evidence from the astronomers. Most persons of scientific turn of mind are keenly interested in keeping track of the current discussions of these great minds, and here is a real chance to “sit in,” as it

were, on the argument. What Eddington offers us is a chatty, intimate picture of developing cosmological theory. We actually see and follow the great thinkers feeling about in the dim light of present ignorance, hitting on this or that, rejecting it, searching farther, testing, debating, wondering. Though this new book is not large (180 pages) it contains a great deal of substance, not at all too heavy for the average intelligent lay reader, and it will be sure of a wide and well deserved distribution.—\$2.15 postpaid.—*A. G. I.*

TIME, SPACE AND ATOMS

By *Richard T. Cox, Dept. Phys., N. Y. Univ.*

THIS is another of the small “Century of Progress” books—small, but what a lot of meat is packed into the 154 pocket sized pages of this one! Plenty of books have covered about the same scope in modern physics but this book is rather an original. The author has an original way of seeing things, of stating them, and of making his readers see them—the same old concepts cast in a different light, as if you had gone around on another side of them and seen them from a fresh angle. There is a lot of not altogether dead easy physics and solid stuffing in this handful—you won’t romp through it at one session unless you are already a physicist. If you are, you will enjoy it anyway, for its unusual point of view.—\$1.15 postpaid.—*A. G. I.*

THE STORY OF A BILLION YEARS

By *W. O. Hotchkiss, Mich. Col. Min. & Tech.*

THIS is another of the small books (137 pages) issued in connection with the Century of Progress Fair (Chicago). It gives a very popular sketch of geology—just about the amount of general geology a person would want to know if he did not care to be on better than intelligent speaking terms with this branch of science.—\$1.15 postpaid.—*A. G. I.*

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Numerology

By E. T. Bell, Prof. Math.,
Cal. Inst. Tech.

NUMEROLOGY, like astrology, is an ancient superstition rampant today among millions who are living, intellectually, in the Dark Ages but don't know it. A professor of mathematics found it interesting, just as a form of insanity is an interesting phenomenon to observe, and looked into it. This 187-page book is the result. He shows what there is to it—or, rather, what there isn't, and why. His weapons are analysis, sly whimsy, and subtle humor—though, unfortunately, his manner of presentation is not easy to follow, unless his reader is also his mind reader, for his style of writing is a bit cryptic. However, as most mathematically-minded readers like their reading cryptic, they will perhaps relish this book all the more on this account. But it will prove too deep for most numerologists' mentalities. Still, no sane person will ever try to alter their fixed state of mind, anyway, hence this will matter little, after all.—\$2.15 postpaid.—A. G. I.

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By WELLS, HUXLEY AND WELLS

SOME months ago Mr. H. G. Wells, his son G. P. Wells, and the biologist, Julian Huxley, published a large two-volume work covering all of the life sciences under the title "The Science of Life." The present little book is a reprint of pages 314 to 643 of that famous, authoritative, and at the same time *readable* work, evolution being one of the more popular high lights of it. This reprint covers paleontology, variation, evolution of man, controversies about evolution and, in short, the general facts which the average person who is interested in evolution would wish to know.—\$1.15 postpaid.

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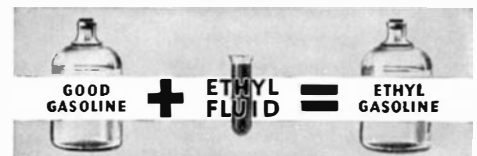
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