

Hon. James W.

Gerard: MUST AMERICA BE SELF-CONTAINED?

SCIENTIFIC AMERICAN

Vol. 151 No. 4

OCTOBER, 1934

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NINETIETH YEAR

ORSON D. MUNN, Editor



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Cover

WHAT would an ancient Athenian have said if told that most of his city during a lapse of centuries would be buried beneath the rubbish and earth dragged in by his descendants and that after two thousand years an alien race would come to Athens from an unknown continent beyond the edge of the world and uncover it, in order to see how he lived and what he did? Our cover shows some of the excavations being carried on in Athens, and described on page 181. In the cover picture the Theseum is at the upper right and the circular floor of Tholos is toward the left.

ACROSS THE EDITOR'S DESK

AS promised on this page last month, we present in this issue one side of a controversial subject that affects every business man and industrialist throughout the country: Shall America be self-contained? Hon. James W. Gerard is firm in his conviction that it should and must. He gives his reasons for his relentless nationalist stand on page 194 of this issue. But, as we said before, there are two sides to every question, and we have arranged for an article by Raymond B. Fosdick which will tell the story of the other side. There is no doubt that the future of American industry rests, at least in large part, upon the policies adopted in our business dealings with foreign nations. These two articles, the second to be published soon, will give you the whole picture, and place facts in your hands which will enable you to form your own conclusions.

PROBABLY nowhere in the history of science can there be found a postulate that has caused so much dissension among the scientists themselves as that of the ether. "The idea of the possible existence of the ether came of the human need for an explanation of action at a distance," writes Churchill Eisenhart, of Princeton University, in an article entitled "The Ether: Riddle of the Ages," scheduled for early publication. Mr. Eisenhart deals with the vicissitudes of the ether theory during the swaddling days of science, putting forth clearly and briefly the various changes through which it has gone in order that science might adapt it to existing needs. Everyone who studied physics remembers the ether: Where is that old friend of the classroom, and what is its status in today's world of science? The answers will be found in Mr. Eisenhart's article.

IT may never have occurred to the reader that it is possible for an amateur to cut and polish worth-while semi-precious gems. All that is needed

is a fair degree of mechanical skill." Thus writes Arthur Knapp in an article on the making of faceted gems by the amateur lapidary. Former articles in SCIENTIFIC AMERICAN have introduced readers to the hobby of gem cutting in its more simple phases; here is advanced work that will prove both fascinating and satisfying. Even if you have no definite interest in the hobby for yourself, you will be interested in

COMING

¶ Raymond B. Fosdick, on the dissenting side of the question "Shall America be self-contained?"

¶ "The Ether: Riddle of the Ages," by Churchill Eisenhart, Princeton University.

¶ "Faceted Gems for the Amateur Lapidary," by Arthur Knapp.

¶ Robert D. Speers on the siphons being built in the Colorado River Aqueduct.

¶ Nickel—the story of how the "devil metal" has become "near-noble."

¶ The 14-inch coast defense guns at the Panama Canal—a two-page drawing.

this article, to be published soon, and particularly in a photograph which accompanies it, showing a group of beautiful gems which Mr. Knapp has cut.

ARTICLES last month and in this issue have recorded progress of certain phases of the work being done at Boulder Dam and upon the aqueduct tunnels which will supply water to 13 communities in California. While the tunnels are under construction, other crews are working on huge siphons which will link together these underground bores. Robert D. Speers, who

wrote the article on the tunnels in our September number, has prepared another on the construction of the siphons, which will be published next month. Aqueduct siphons are not siphons in the true sense of the word. Rather, they are . . . but Mr. Speers' article tells the story in detail; watch for it in November.

NICKEL, called the "devil metal" by early miners because of its frequent appearance in silver ore and its apparent uselessness, has, with the development of the science of alloying, assumed a position in metallurgy that entitles it to be called "near-noble." More or less of a curiosity 50 years ago, nickel production rose gradually until the World War, at which time the demand for it jumped tremendously, for use in armaments. Then production again fell off, but research went to work on the problem, with the result that today nickel is used for hundreds of purposes and its production is growing rapidly. The whole story of the nickel industry is told in an article ready for early publication.

ONE of the vitally important key points of American shipping, which the military forces of the United States must be prepared at all times to defend against any invader, is the Panama Canal. To accomplish this, new 14-inch railway guns and emplacements for them have been developed. In ingenuity of construction, ease of operation, and mobility, these guns rival anything that has ever been produced. Placed in the Canal Zone, they represent a definite step forward in defensive armament and should serve to make the Canal safe for shipping regardless of the designs of belligerents. A two-page wash-drawing, to be published next month, gives complete details of these guns and emplacements.



Editor and Publisher

**GOOD SERVICE
THROUGH
TRYING YEARS**

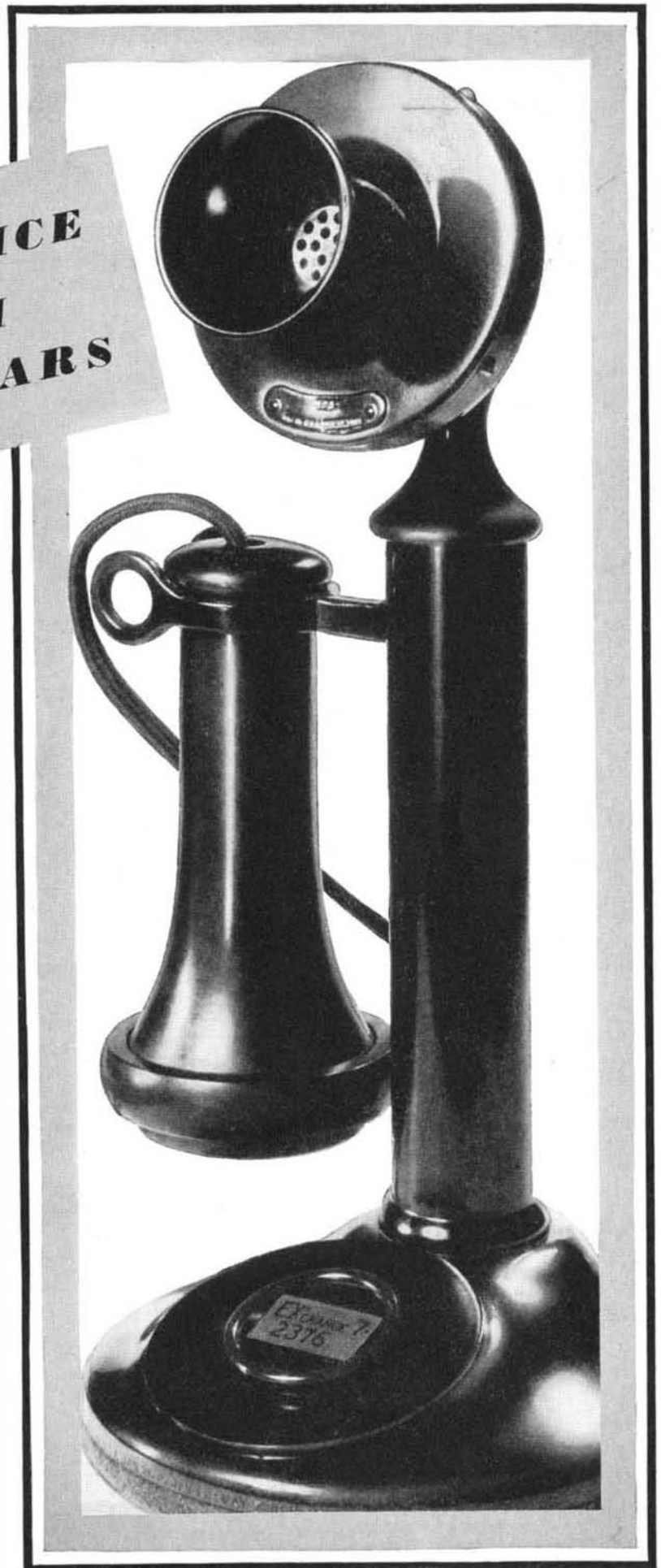
THROUGH recent trying years there has been no letting down in the quality of your Bell telephone service. On the contrary, improvement has gone steadily on.

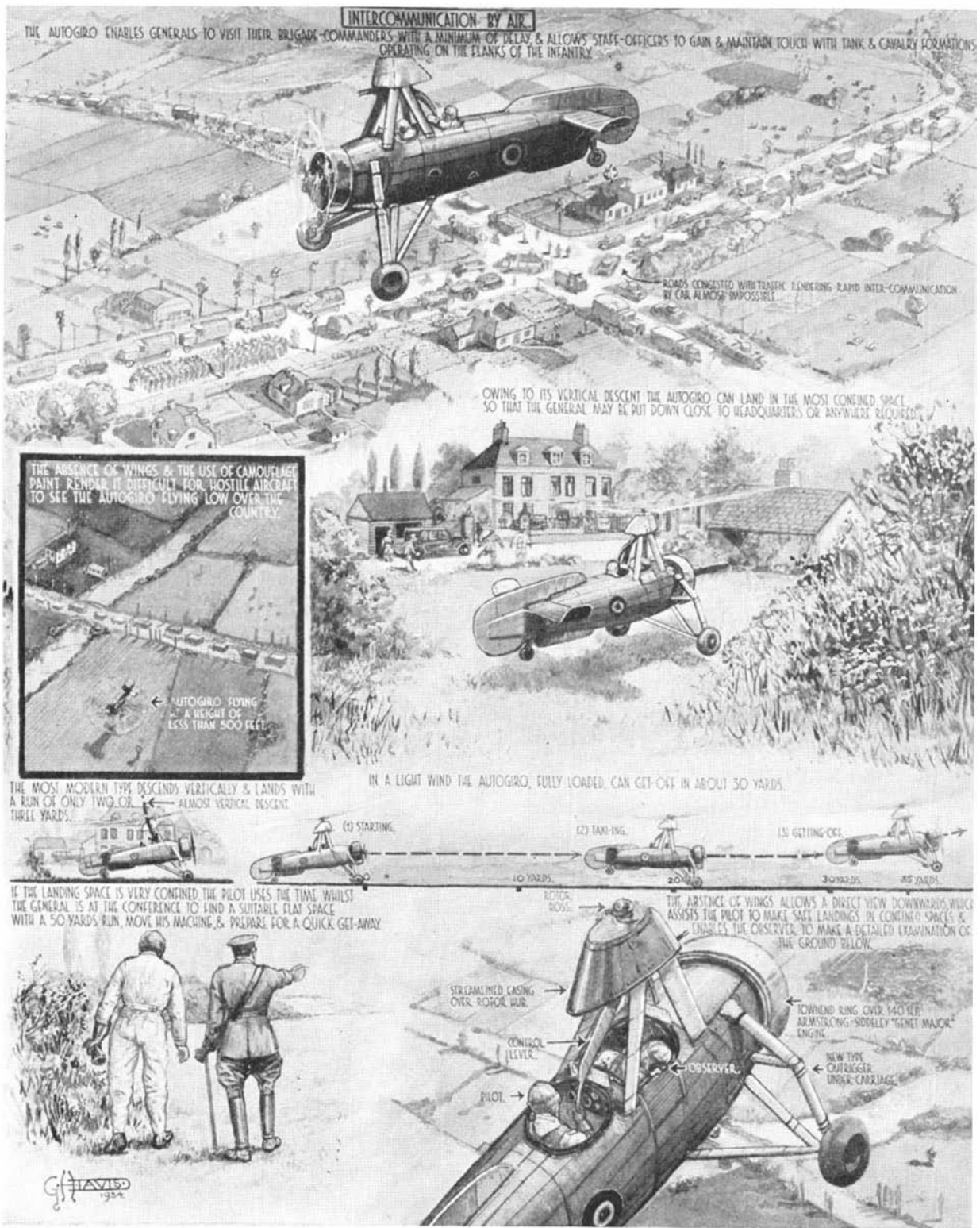
On long distance and toll calls, the percentage of calls completed is now higher than ever before. The average time required for making these connections has been reduced from 2.8 minutes in 1929 to 1.5 minutes. Since 1929, mistakes by operators have been reduced one-third and more than 99% of all telephone calls are now handled without error.

The number of service complaints by customers is now the lowest on record and reports of trouble with instruments have decreased 17% since 1929. It is truer than ever that this country enjoys the best telephone service in the world.

The ability of the telephone system to improve its service in difficult years is due to unified management and a plan of operation that has been developed and perfected over the past half-century. In good times and bad, it has proved the wisdom of one policy, one system and universal service.

BELL TELEPHONE SYSTEM

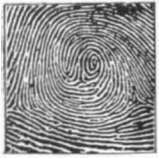




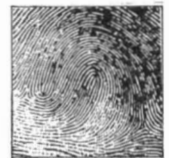
Copyright, The Illustrated London News

THE AUTOGIRO IN MILITARY MANEUVERS

AUTOGIROS of the latest type are now, for the first time, part of a regular unit of the R.A.F. The "C 30a" shown in the above drawing has no stub wings or movable elevators or rudders. Entire control of the ship is maintained by a single control lever which tilts the rotor in any desired direction, as shown at the lower right. The absence of wings has many advantages, not the least being improved vision from the cockpits. The desirable features of the autogiro should make the ship of extreme importance in all phases of military observation and reconnaissance, as suggested here.



Right: J. Edgar Hoover, Director of the Division of Investigation, United States Department of Justice, who is directly responsible for the development of the finger-print classification system in the United States. Below: Finger-print files



UNCLE SAM, ACE DETECTIVE

By HERBERT FEARON

HE swung off a freight train at a little jerk-water town in Texas. Just another hobo. Or at least so he would probably go as he had come, without anyone even learning his name. But the local minion of the law had a place for vagrants. A brief contact with the jail generally had a wholesome effect on an occupant—he was quite certain to depart for good as soon as released.

Turning the key on the apparently harmless, though useless individual, was only the prelude, however. The officer had been acquiring some new ideas on crime prevention, sort of a free mail-order course on crook catching. He drew from his desk a prosaic looking square of cardboard; with the help of the vagrant he placed a little data on it and dropped it in the mail. When the reply came back in a few days he hastened to put an extra guard around the jail. His hobo was a deserter from the army who had murdered an officer in France, had escaped to Spain, had killed a jailer there, had wandered through other lands, and for no particular reason at all, had stopped over at this quiet Texas town.

The scene changes. A prisoner stands before the bar to receive sentence. Apparently he will be dealt with mildly; his crime was not great. He protests that this is his first deflection from honesty. His voice betrays no quaver, his words carry conviction. But judges are becoming more particular in recent times;

the tide is setting in toward life imprisonment for those whose records total conviction on three felonies. The judge looks searchingly at the prisoner and then down at his desk. From somewhere had come a story of this culprit's past, a rather long, and a rather illegal past. Again one of those squares of cardboard had performed its silent, deadly mission.

MYSTERIOUS? If you had followed those cardboards through the mails to their very prosaic looking destination you might have been even more mystified. They were delivered by the mailman at an ordinary looking office building in Washington, D. C. There keen-eyed men quickly examined a group of strange marks on them and wrote down certain numbers and letters. Their whole equipment consisted of a pencil and an ordinary magnifying glass. The large room in which they worked contained only long rows of

filing cabinets, such as might be found in any office.

Not very much to work with, but sufficient to bring terror to a host of criminals, not only in the United States, but abroad. Those filing cabinets contain more or less information about the private life of approximately 2,500,000 people, but when you open the cabinets there greets your eye only an endless array of those cards, eight by eight inches, to be exact—a grand total of over 4,000,000.

There is no possible doubt as to the accuracy of the record, for each card contains the person's signature in ink—signatures that can not be forged. Though the lines are graceful curves, they can hardly be described as specimens of free-hand movement, for most of those signatures were made under requirements of the law. They are finger-print cards and the signatures were made by the tips of ink-smudged fingers

and thumbs. It takes only about two minutes by the clock for a police officer to obtain an autograph and drop the card in the mail. But a sordid story may be disclosed when those ten inked patterns fall into the hands of the men with the magnifying glasses who move silently amid long rows of filing cabinets.

Innumerable suggestions are brought forth these days for curbing criminality. Much uninformed talk is heard about the extent and the nature of the lawlessness plaguing the country. And always there is the overtone of critical comparison of America with other countries as to expeditious dealing with crooks. But unknown to the majority who thus discuss, there is silently being built up at the nation's capital an organization that bids fair to strike more terror to the lawless than the vigilantes ever did; to place the United States in the very forefront in scientific, speedy crime detection; and to provide us with our first accurate crime statistics on a national scale.

IN 1924 the Department of Justice accepted from the International Association of Police Chiefs a limited collection of finger-print cards, on the Government's promise to develop this feature of criminal detection. To this collection were added the cards of Federal offenders, and certain others, which had been kept at Leavenworth Penitentiary. This nucleus of finger-print records logically came into the charge of the Division of Investigation, that branch of the Department of Justice which investigates all violations of Federal laws, and from which work the Federal agents, Uncle Sam's regular detective force.

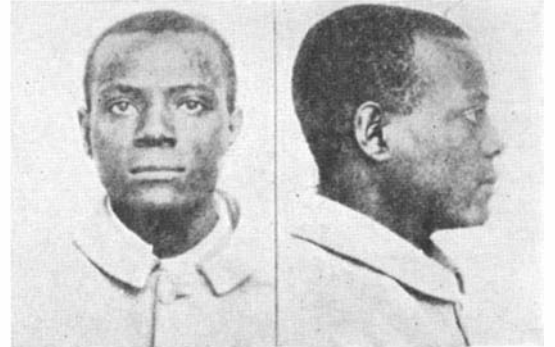
In a large room were piled the boxes of cards. How was a nationwide clearing-house for crime to be constructed out of those packing boxes? The majority of law-enforcement officials in the country were not particularly finger-print conscious. They were even less familiar with the technique of finger printing prisoners. And besides, police officials, from town constables up, generally like

to direct their own affairs. How could they be persuaded to adopt the idea of co-operating intelligently, with properly taken prints, to create a vast Federal crime-information bureau?

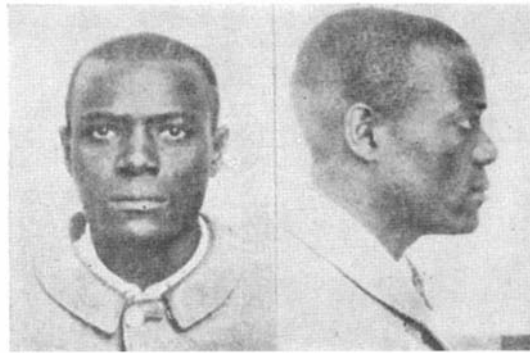
The answer to that question is J. Edgar Hoover. He had served as Assistant Director under William J. Burns, whose detective reputation had lifted him into the office of Chief of the Division of Investigation. On Burns' resignation Hoover was made Director. That was about the time the packing boxes were brought in. They contained approximately 800,000 cards, a rather tidy number to start with. Scotland Yard right today has only 500,000. Most foreign countries are quite compact, with few state lines to create constitutional or physical bar-

more often could the clearing house send back some positive report on cards sent in.

To get the records started—hosts of them from 48 states—and then to keep them growing chapter by chapter—that was the task before Hoover. Some areas of the country were slow to respond. Just another extension of the long Fed-



Bertillon measurements are not always a reliable means of identification. The measurements of these two Negroes are nearly identical, but the finger-print records tell a totally different story



eral arm, more Washington red tape—apparently that was the reaction. But the "service" talks won. They had to win; there was no Federal law to compel co-operation.

riers. The experience of other lands, therefore, could hardly provide a satisfactory solution of the problem.

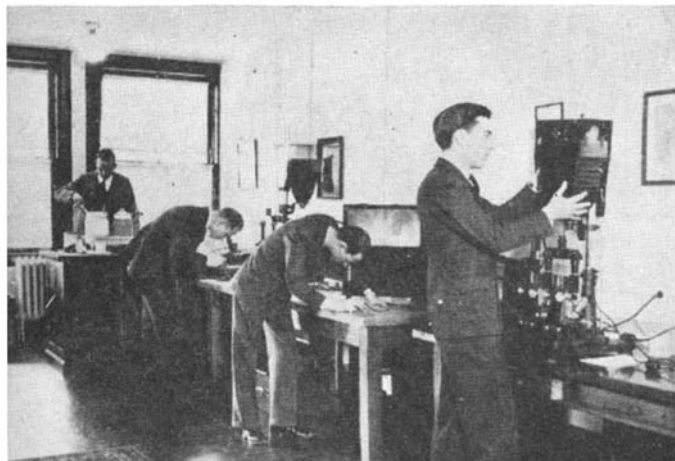
Hoover saw the possibility of making Washington the great exchange for criminal information. He set out immediately to impress the police of the country with the soundness of his idea. His speeches before law-enforcement officials sounded more like the "service" talks of a Rotary Club business man than the perfunctory statements of a government official. He sent out literature to every city in the country explaining how to take good finger prints, and describing the equipment needed. He had standardized cards, those mysterious eight by eight pasteboards, sent out to the police everywhere with franked envelopes for sending them back to Washington.

It was evident from the start that the value of this finger-print clearing house to the police, and thus its success as a Federal venture, would be in direct ratio to the number of cards sent in. The more cards, the more records of criminals' activities, and the more complete the records the

Figures are usually rather pale, lifeless things but here's how successfully the finger-print bureau idea has been impressed upon law enforcement officials in the decade since it was started: The 800,000 cards have grown to over 4,300,000. The number of separate law enforcement agencies—constables, sheriffs, city police departments, and so on—sending in prints has increased from 987 to 6277. Not only the 48 states, but 49 foreign countries are contributing. In 1924 87,000 finger-print cards were received; in 1933 more than 500,000. But the figures that really tell the tale of the deadly threat to crookdom are these: In 1924 a positive report as to a previous record could be sent back from Washington on only 17 percent of the cards received; in 1934 the percentage has risen to almost 47. That means that on approximately every other finger-print card sent in today, some information can be returned regarding the past life of the prisoner.

In the drab office building on Pennsylvania Avenue can be seen the kind of organization that has been built from those packing boxes in ten years' time. In comes the day's mail—about 2200 cards. Here is one from the Police Department, Birmingham, Alabama—the finger prints of a Frank Taylor held on a robbery charge. That name "Taylor"

In the Criminological Laboratory in Washington. Man in center is using a device for comparing enlarged finger prints. At right, camera is being used with a comparison microscope



means just exactly nothing. It might have been Julius Caesar or Napoleon so far as the men with the magnifying glasses are concerned. But the F. P. C. (Finger Print Classification, the distinctive combination of letters and numbers that describes exclusively a certain individual's finger prints) might mean something. The card is taken to a certain filing cabinet. Out comes a small handful of cards for comparison. Here is one with the same F. P. C., though the name on the card is Homer George Edwards.

Now what has Edwards, alias Taylor, been doing? The cabinets before us do not give this information; they contain only a "master print," the best print of the crook available. The serial story is kept in a separate file, which is cross-referenced by number. Out comes the jacket with this particular number. Well, well, Frank Taylor is up to his old tricks. Six years before he had been arrested in San Antonio, Texas, on a robbery charge. He had been sentenced to the state penitentiary. Two years later he was again committed to this institution for life for murder, but was declared insane and transferred to an asylum.

But what is this flaming red "Wanted" notice clipped to the record? Edwards had escaped from the asylum—a crazy murderer at large—and Texas wanted him back. So they had asked Washington to keep a lookout for him. Perhaps he might fall into the hands of the law somewhere else, be finger printed, and thus the clearing house would be able to tell Texas the location of their man. It took only the time required for a telegram to travel, to tell the Lone Star State that its missing, murderous lunatic was in custody of the Birmingham police. And it took no longer for Texas to request Alabama to hold Taylor for them. That's a new version of the sinister triangle: sinister, this time, only for the crook.

SINCE the general use of finger prints as a means of identification, crooks do not depend so much on changed names to conceal their identity. They would give anything to change the signature on their finger tips, though. There are cases where operations have been undergone, even mutilation resorted to, in a desperate attempt to change the distinctive pattern by which they are classified at Washington.

Every month an average of 346 criminals, who are wanted for every variety of felony, or as Escapes from penal institutions, are returned by the little red slips of paper that are clipped to the

crook's record in the Bureau. And yet this is but a by-product of the clearing house's activity. Its main business is to give the past record of a man, that his present captors may have as many facts before them as possible.

In another room in the Bureau stands a file such as might be seen in the cata-



1645-5326 Moses Harman



4580 Nathan Morris



Further proof of the efficacy of finger print identification. These two groups of photographs show how the physical appearance of an individual may be radically changed by so-called natural disguises. Finger prints, however, remain a constant identification throughout life

log room of a library. It is full of cards about three by five inches in size. Each card has only one smudge of ink on it. It is a single-print file; that is, a file keyed, indexed, and with a F. P. C. in terms of a single finger print instead of the group of ten. When the Bureau decided, a year ago, to create this file it had to devise certain refinements of the regular classification system.

The value of this new system is immediately evident when the fact is known that under the regular classification it is impossible to ascertain whether the prints of two or three fingers found at the scene of a crime—latent prints, they are called—belong to an individual whose card is found in the Bureau file. And rarely does a crook leave prints of more than two or three fingers, if that many.

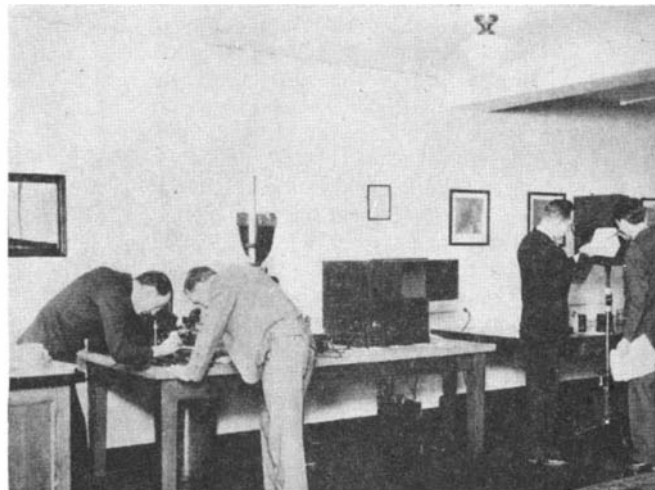
From the main file of

master prints there were taken the cards of the chief public enemies in the United States, a total of 3500, and from these, separate prints of each finger and thumb were made on the little three by five cards, a grand total of 35,000 cards. Now if a major crime is committed by any one of these 3500 public enemies and he is so careless as to leave the print of just one finger tip behind him, his identity can soon be learned from Washington, and that's half the battle. This special file is now well organized. It will grow greatly beyond the 3500 present total.

But that's only part of the story. At the same time this select list was being especially honored by a tenfold classification, certain information about the criminals was being gathered—height, weight, build, complexion, hair, eyes, teeth, speech, race, dress, and so on, a total of 21 separate features, with their various subdivisions. A numerical value was arbitrarily given to each physical characteristic, thus enabling them to be compactly tabulated, like census records, by punch marks on small cards that carry corresponding numbers. Sounds a little complicated, it must be confessed, and a card bristling with numerals, with a score of the numbers punched out, looks even more bewildering. But that compact, perforated little piece of cardboard gives a very detailed description of a man, and in a form that can be handled quickly and accurately by machine.

HERE is the value of this file: A partial description has been obtained of some suspect in connection with a crime. The police have reason to believe that a member of some important gang, whose record the Bureau has, committed the deed. Perhaps they have half a dozen identifying marks—he was tall, heavy, blond haired, lame, ruddy complexioned and had protruding upper teeth. They check these off on a blank provided by Washington. Six holes are punched on a card at the Bureau, an electric button is pressed, and this six-holed card is tallied against the 3500

Student agents in the Criminological Laboratory conducting experimental examinations to learn the use of apparatus





A well-known Public Enemy, and his complete record, reproduced from the eight-by-eight inch card

cards on file. The result is a small handful of cards that have the six characteristics in common with this new card. Of course none of these may be the man wanted, but then again, one of them may be. A full description and photograph of this handful of possible culprits is then sent back to the police. Can they identify one of them? That is their part of the program.

Strictly speaking, this special modus operandi file, as it is called, and the single-print file, owe their beginning to the launching of the Federal drive to stamp out kidnapping and extortion. From the day that kidnapping was made a Federal offense, and the task of dealing with it was placed upon the Division of Investigation, the subsidiary Bureau of Identification has been called upon to contribute its full measure of aid. That is one reason why all the kidnapping cases thus far handled by the Federal agents, a total of fifteen, have been solved, and in most instances the guilty parties are already serving sentences.

EVERY month there goes out from Mr. Hoover's office a 32-page bulletin entitled, "Fugitives Wanted By Police." In each case a brief description is given, including the F. P. C. This bulletin, which every police office receives, exacts a steady toll of crooks enjoying a brief respite from the law. This is in addition to the "Wanted" notices placed with the criminal's record in the Bureau. Few countries attempt to carry on anything approaching this in the way of broadcasting news of fugitives wanted.

In the files of the Bureau are the prints of some 160,000 persons who are on Uncle Sam's payroll, Civil Service employees. Because of the almost exclusive use of finger prints in relation to crime, the government has been slow to use them for any other class of people. But for the last five years the Civil Service Commission has, as a matter of precaution, taken the finger prints of applicants. And here is what has come to light: The first year one out of 13 applicants was found to have a criminal

record; the second year, one out of 14; the third year, one out of 22; the fourth year, one out of 70; and last year, one out of 40. The rapid decrease in the number of those with criminal records probably indicates that the man with such a past is increasingly hesitant to ask for any job where finger printing is involved in the application.

Every variety of offense, from disorderly conduct to bigamy and murder are represented in the records. An echo of the Volstead era is found in the story of the man who applied for a position

workings to be convinced that here lies the greatest threat to the criminal world. There is generated in you for perhaps the first time in your American life, the feeling that the forces of law and order are really getting the upper hand. You picture what this Bureau will do in the future now that it has become well organized. But you have heard no boastful claims as to what it is doing or will do.

There is an unusual quiet about the place. But there is an *esprit de corps*. You feel it. They work against time. At first the goal was to report within 48 hours on all cards sent in. Now it is 36 hours, and where telegraphic report is requested the time element becomes negligible. They will illustrate the need for speed with the story of the telegram that came from an Oklahoma city placing a "Wanted" notice for a certain criminal, for murder. When that telegram arrived the Bureau was in the very act of answering St. Paul regarding this crook, who was being held by the Minnesota city for investigation. A little delay might have let a murderer escape. The magnifying-glass men are not planning that murderers, or any other brand of crook, shall escape.



as a Federal Enforcement Agent. His finger prints disclosed that he was an Escape from a penitentiary. He must have had a low estimate of the identification possibilities of finger prints!

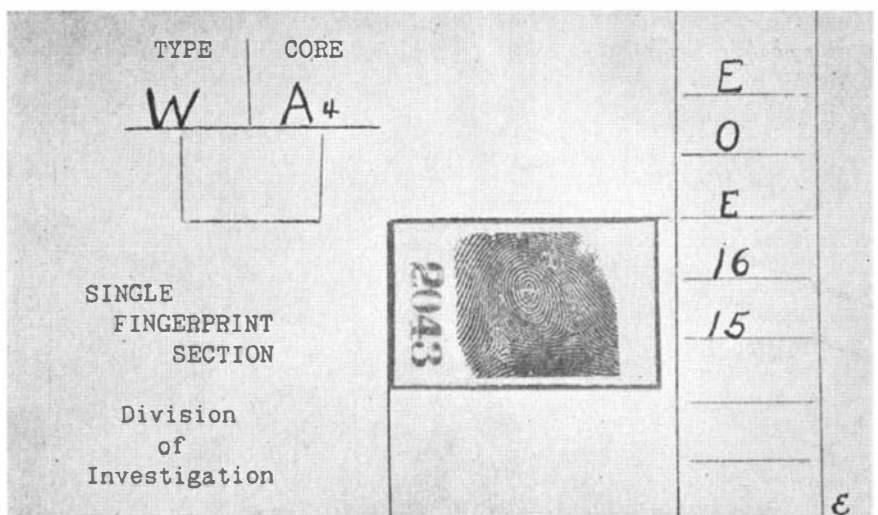
Most picturesque of the varied services of the Identification Bureau, or perhaps most pathetic, is the use to which it is being put by private citizens. It is not an uncommon thing for prominent persons to send in the finger prints of their family for filing at Washington. They wish to make certain that in the event of kidnapping there will be some positive way to identify the loved one.

When you have spent long hours, as this writer did, following through the maze of activities in the Bureau, you come away a little bewildered, but with a sufficient understanding of its smooth

YOU stop a moment at a desk on your way out. Telegrams are being dispatched. Birmingham is being informed that the man it wants on a motor theft charge has been arrested in Middletown, Ohio. The Escape that Missouri State Penitentiary is looking for has been arrested in an Oklahoma town on investigation. The Escape that the Reformatory in Granite, Oklahoma, wishes to lay hands on again has been arrested in Alliance, Nebraska.

Sort of winding up a few loose ends at the close of the day, they explain to you.

You go on home to enjoy the best night's sleep in many a day, dreaming contentedly of men with mysterious little glasses who catch all your enemies.



An example of one of the file cards in the single-print file

OUR POINT OF VIEW

No More War?

WHAT seems, at first glance, to be the most practicable idea for preventing war that has come to public notice in recent years—excluding the not-yet-attempted changing of human nature—is that advanced by Professor Ward V. Evans of Northwestern University. He says: “. . . it might be possible now, by properly controlling the materials upon which war depends, to prevent war entirely.”

Some years ago, our War Department listed some 28 or 30 products and minerals without which many of our industries would be crippled, which would be essential to the successful conduct of a war (offensive or defensive!), and which the United States can obtain *only by importation*. It is these minerals and raw materials which Professor Evans would control. His scheme would demand an international agreement to refuse to supply warring countries with such materials, and this, in turn, would make necessary an economic census to see just what each nation needs and must import.

Suppose we evaluate this scheme in scientific language, ignoring altogether politics and diplomacy. While this journal is neutral in the discussion of economic nationalism, one side of which is taken by Mr. Gerard on page 194 of this issue, we agree with him that science has proved capable of supplying synthetic substitutes for many necessary things in times of emergency. England cut off Germany's supply of tungsten for high-grade steels during the World War and Germany turned to molybdenum and made a good steel for her war material. England then cut off the supply of molybdenum and German scientists made an excellent steel using nickel.

Two of the favorite raw materials which, it is claimed, might be our undoing, should our imports of them be cut off during war time, are crude rubber and manganese, the latter for steel manufacture. In our September issue we discussed an adaption of DuPrene (“synthetic rubber”) to the manufacture of tires that are as satisfactory as those made of plantation rubber. DuPrene is expensive but at any rate it is a scientific product that *could* solve a war-time rubber problem. As for manganese, it has been said that this country possesses only some low-grade ore, but we have reason to believe that, like the report of Mark Twain's death, this report has been grossly exaggerated. We

believe there are rich manganese ores in this country, the mining of which has been prevented—for reasons.

As SCIENTIFIC AMERICAN is unalterably opposed to war, in principle, we wish there were some possibility of putting Professor Evans' scheme to the test. Because science is so utterly efficient, however, this seems a vain hope. War or no war, science will continue finding something new that is better than the old!

Light and Death

WHILE automotive engineers apply their utmost skill to improve motor cars in every conceivable way, with an eye cocked toward the sales department, a grisly graph follows the curves of their production sheets. Latest records show 31,000 motor-vehicle fatalities in 1933, or 5 percent above those in 1932. We cannot hope ever to control entirely the human emotions that cause accidents due to carelessness; it seems next to impossible to protect the motorist against himself by enacting regulatory laws that are so frequently broken. But there is one cause of accidents that can and should be carefully considered by every community, and the remedy applied.

Fatal accidents at dusk or after dark have been on the increase, but a study of the situation shows that where streets are provided with the best light, accidents have decreased as compared with streets where the lighting is poorer. For example, it has been shown that between 5 and 8 P.M., when it is light in summer but dark in winter, winter fatalities exceeded those during the summer months by nearly 100 percent. In cities with better street lighting, however, the excess of fatalities in winter is much less. Where street lighting cost over \$1.50 per capita, the winter fatalities were only 32 percent in excess of summer, while in cities with a cost below 50 cents, the excess was 140 percent.

The remedy is obvious. Street and highway lighting facilities have been constantly improved, in step with the improvements in motor-car construction, but many communities have been backward in availing themselves of the improvements and thus protecting their citizens. In fact, many budgets have been reduced for purposes of economy by the extremely unwise move of curtailing street lighting. When less light and more deaths go hand-in-hand, every motor vehicle fatality on a poorly light-

ed street or highway constitutes a potential charge of accessories to murder against those responsible for the inadequate lighting.

Trees

THE fact that a 75,000,000 dollar tree-planting project in the middle west has been authorized, and that preparations for realization are now going forward, lends added proof to the shortsightedness and selfishness of man in the development of the United States. Where once stood mighty forests of virgin timber will now be found vast stretches of denuded territory, swept by burning winds in the summer, stripped of fertile top-soil by the action of rains that run off unimpeded, and practically worthless.

This is the work of man who ruthlessly cut down forests for the lumber, without thought for the future or for the effects which might arise from logging operations on an uncontrolled scale. Now the harvest has been reaped, and at this late date something is to be done about a situation that has become so acute as to constitute a national menace. To restore in even small measure the forests of only a few years ago will require generations, but a start has been made. The administration is to be congratulated on the splendid scale on which is based the proposed tree belt in the middle west; let us hope that politics will not interfere to prevent carrying the project to a successful conclusion.

SCIENTIFIC AMERICAN has for years advocated conservation of our natural resources, and reforestation where needed. We now wish to add our voice in support of a proposal made by Charles Lathrop Pack, of the American Tree Association, for the planting of town forests, a project which every community can undertake for itself. It is obvious that such forests, patterned according to local conditions, will provide employment at the present time, and shelter and soil protection when grown.

The farmer, also, can do his share, especially in regions where trees have been thoughtlessly eliminated from the landscape. Let him plant trees near his house and outbuildings—trees that will add to the esthetic value of his property, provide grateful shade in summer, and help to reduce the devastation wrought by alternating burning droughts and overwhelming floods. If all concerned will co-operate to the common end, many of the effects of man's misdirected meddling with nature can be overcome.

STRIKES, BUSINESS, AND MONEY

By JAMES H. RAND, JR.
President Remington Rand, Inc.

IN a desire to make for our readers a fair appraisal of important and timely economic problems, we asked Mr. Rand—who is Chairman of the Committee for the Nation to Rebuild Prices and Purchasing Power—to prepare the accompanying article. Taking no sides ourselves except that we do see great danger in inflation, we hope soon to be able to present a further discussion on monetary—and, therefore, industrial prosperity—problems in an early issue. As to the conclusion to be reached, the reader will have to be the judge.—*The Editor.*

THE immediate danger, gravest for our country, is not the violent recurring strikes from coast to coast. It is the possibility that we may be misled into failure to see what is causing these strikes, and fail to remove that cause. The greatest danger is that, in blind resentment against some ill-advised policies, we might overlook the corrective steps that are indispensable to America's recovery.

Whether it is evidenced in San Francisco, Amsterdam, or Chicago, a demand to overthrow the existing social order thrives on deflation. The widespread disorders in Holland, the threats to stability of other governments of the European "gold bloc"—all an index of unbearable deflation—have come at a time to help us interpret similar unrest in the United States.

It should have been apparent for a long time to our financial leaders that we had gone beyond the limits of "safe" deflation. They should have realized that unless we restored commodity prices and taxable values and employment before the economic cancer of deflation reached the vitals of American institutions, the profit system could not survive.

Our financial leadership, clinging to its gold standard traditions, has been slow to realize, slow to admit, slow to face this challenge, and quick to oppose all who did recognize and did face it. Some still appear to believe that capitalism and our free American institutions would be safe and that all would be well if we simply would vote this fall to return to what we had in 1932.

I do not believe it. When the Dutch riot—those phlegmatic, precedent-respecting, law-abiding Hollanders—when they break out in strikes and Communist riots, anything *can* happen, anywhere. We are no more sparkproof than the Dutch.

Many farm leaders and some business men have taken the trouble to find out that the depression came from monetary

causes. The five-year fall in commodity prices resulted simply from the increase in the purchasing power of our gold dollar. This threw economic groups into disparity, killed purchasing power, created unemployment, destroyed for business the opportunity to make profits.

The evils that flow from monetary derangement can be corrected only if the monetary system is soundly rebuilt. Therefore no Congress ever had to make policy decisions so vital to America as the one about to be elected. It can either plunge us further into the socialistic trend—or it can reverse this trend.

Because the United States was the last of 34 nations to raise its price of gold and then hesitated to raise it far enough to restore economic balance, we have been rushed into socialistic experiments in government control that undermine American industrial leadership.

WE were tied back last February to a fixed weight of gold and its consequent deflation, but the public was not told that this was to be government policy. They had to wait to learn it from the report of the Bank for International Settlements issued in Switzerland on May 14.

If industry wishes to be free, it must insist upon reflation. It must insist that the half-executed program to restore and thereafter keep stable the value of our money shall be carried through. This requires that legislators irrespective of party must possess *monetary understanding* and that they be supported by an educated public opinion.

Economic groups must be brought back into price balance so that they have purchasing power for one another's products. Price level restoration will rebuild employment and profits and scores of billions of security and real estate values which were wiped out by deflation. Prompt restoration of prices and profits would cut the ground from under the argument that regimenting industry and agriculture is necessary.

Let me review briefly the facts that bear on this problem of our money and its relation to the social unrest that we all dread.

The world has in the last five years put a new value on the commodity gold. A fixed weight of gold, say one ounce, buys today two and one half times as much of *basic* commodities as it did on the average in the years 1926 to 1929. This represents a rise in the value—that is the real purchasing power—of gold of 150 percent. The new, excessive value the world has given to the commodity gold in the last few years has been due to panicky world demand for gold, and failure to discover any great new sources of gold supply.

The world dictates the *value* of gold, but each nation determines its *price* of gold in terms of its own dollars, francs, pounds, and so on. Fix that point in your mind. *It is all-important in understanding this problem.*

Failure to offset this rise in *value* of gold by adjusting our *price* of gold pulled down the price of everything that is measured by gold and thereby wrecked our economic system. To correct this rise of 150 percent in the world *value* of gold, we have increased our price of gold only 69 percent.

If a lumber dealer were told that the yard measure had increased to $2\frac{1}{2}$ times its former length, he would instantly know that business on the old basis had become impossible. If the change occurred imperceptibly over five years, when he discovered it he would know he had become insolvent. He would move to correct the yard measure—not part way, but all the way.

But instead of demanding that this same correction should be applied to our dislocated measure of value, many business men have acceded to policies that undermine their own leadership and may endanger the institutions of their country. They have listened to advice of some of our international bankers who say that to correct this distorted

measure of value would be dangerous "tampering" with the false gold "yardstick." Failing to see—or refusing to admit—that this change in the "yardstick of value" really caused the depression, they subscribe to the mass delusion that it was "over-production" by agriculture and industry.

Habit-thinking, as in all old institutions, is so firmly lodged in the international and central banking world that its gold traditions must be broken down from the outside. Industry and agriculture, the producers of real wealth, have a responsibility to themselves and to their country to help solve the problems precipitated by a breakdown in the monetary mechanism. If necessary, they must insist that financial leaders shall accept necessary reforms.

The immediate task before us is to fight off the renewed efforts to tie our dollar to a price of gold too low—the very cause that brought on the deflation of the past five years. What too low a price of gold means to American industry and agriculture can be seen by examining what has happened to basic commodities.

FARMERS produce mainly basic commodities. (The easiest way I know to remember what are the "basics" is to catalog the principal foods, fibers, and metals of worldwide use which supply man's primary needs for food, clothing, and shelter—the necessities of life.)

Regardless of credit expansion and contraction, the world price of basic commodities follows the world value of gold—because gold is the only world money. Each nation's general price level follows, with some delay, the level of its basic commodities. Therefore, if a nation cannot live with its domestic price level dragged down to the low level of world prices expressed in gold, it must raise its price of gold. That is, in order to offset the smaller amount of gold which the world will give for commodities, each nation must divide the gold ounce into more units of its own currency—dollars, shillings, francs, etc. The alternative is to suffer needless deflation and wait in hope that the world will stop hoarding and change the value it gives to the commodity gold, or that vast new gold fields will be discovered before it is too late.

The meaning and importance of "raising the price of gold" become clear and easy to understand if we follow through a typical basic commodity, such as cotton.

A bale of cotton was exchangeable the world over for five ounces of gold,

or its equivalent in any country's money, only five years ago. In every part of the world today it is worth around 1½ ounces of gold. All other farm products have fallen similarly in value, in terms of gold—and, generally speaking, have not risen. We have 11- to 12-cent cotton only because we have changed our price of gold. Cotton the world over is still worth substantially no more in gold than it was when we had 6-cent cotton. Destroying American cotton did not

this seven billion dollars does not leave the farmer enough money to buy any volume from industry.

Congress delegated authority to the President under the Thomas Amendment to raise our price of gold a maximum of 100 percent—from \$20.67 to \$41.34 an ounce. Economic "orthodoxy" predicted (mistakenly) that disaster would follow any departure from our old price of gold. But for deflationary influences opposing and deterring prompt and forceful action for recovery, we should have been much further on.

Prompter recovery in the United States, increasing the demand for world commodities, might have helped halt the world flight of liquid capital into gold for hoarding. Instead, gold continued to appreciate. Between March, 1933, and March, 1934, the commodity gold gained 20 percent more in value. That is, the average of basic commodities worth 100 ounces of gold in 1926, exchanged for only 48 ounces in March, 1933, and now exchanges for only 40 ounces of gold.

I HOPE that before this article appears in print, President Roosevelt will have taken command of the ship—taken it out of the influence of the deflationists and internationalists—and acted on the gold price with the same forthrightness he displayed when he put domestic price level recovery ahead of international

exchange stabilization at the London Economic Conference in July, 1933.

If the President will do this, using in full his gold revaluation authority under the Thomas Amendment, he can immediately restore 1¼ billion dollars of additional farm buying power. From \$35 to \$41.34, a rise of 18 percent, should bring a corresponding rise over last year's seven billion dollars of farm income. At this writing, published estimates indicate that drought-made higher prices and lower yields, plus AAA "benefits", will leave farm income at only seven billion dollars.

President Roosevelt has only two ways to fulfill his promise to restore the nation's price level. One is to raise the price of gold adequately. The other is by printing press inflation.

The gold pricing policy has worked. Basic commodities have risen as much on the average as the rise in our price of gold. Basic commodities can go no higher with gold at 35 dollars an ounce—unless the world lowers its present value of gold.

To wait for complete recovery until the world value of gold falls of its own
(Please turn to page 221)



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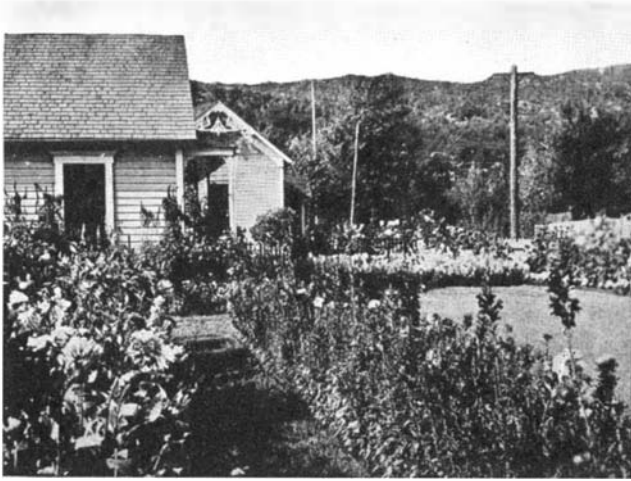
The first bale of the 1934 cotton crop, bearing placards telling a story of gold which is significant

affect its world value. It only caused other countries to plant more!

Farm income between 1921 and 1929 ranged around eleven billion dollars—that is, approximately 500 million ounces of gold, or the currency for which that much gold could be exchanged when our gold price was 20 dollars an ounce. By 1932 our farm crops brought only 200 million ounces of gold or its currency equivalent. Why? Because gold had changed in value, and we had not changed its price in dollars.

The Hoover administration, under the habit-bound advice of the Federal Reserve and international banking leadership, kept the price at 20 dollars. Therefore, with the value of our farm crops reduced from 500 to only 200 million ounces in gold, farm income was reduced to four billion dollars in 1932.

Most of the countries that are farthest out of the depression have raised their price of gold 100 percent—some more. By going up only 69 percent—to 35 dollars an ounce—and stopping there, President Roosevelt restored farm income to only seven billion dollars. With increased taxes and public debts, unchanged freight rates and fixed charges,



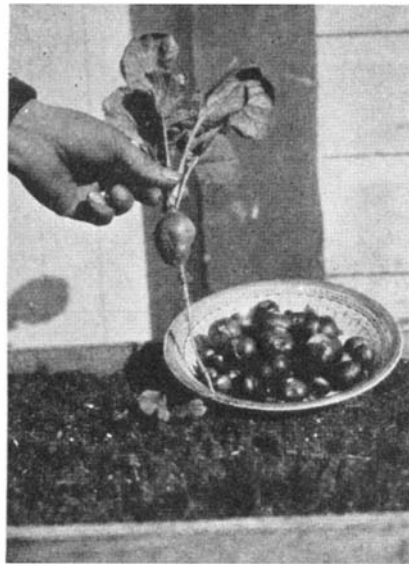
A fine flower garden and lawn in Skagway, Alaska, near the Yukon Territory



A prospector and his vegetable garden near the shore of Great Bear Lake



Arctic daisies blooming at Chesterfield, on west coast of Hudson Bay



Radishes grown at Bernard Harbor, 250 miles north of the Arctic Circle



A poppy-like flower in bloom near the Arctic Circle on Baffin Island

FLOWERS IN THE ARCTIC

By JAMES MONTAGNES

THE Arctic may have heavy snows and bitter cold for eight or nine months of the year, but during the remainder of the twelve months flowers bloom, meadows appear, and even in the most northern settlements vegetables grow. These are facts, backed by photographs, brought out to civilization by Canadian government explorers, by fur traders, missionaries, prospectors, police, and others who live in the far north.

Flowers have been found growing within 400 miles of the North Pole by investigators who traveled to the tip of Ellesmere Island, the last big Arctic island before reaching the Pole. There these botanists found hundreds of varieties of flowers, mosses, lichens, and similar plants.

Practically the entire northern mainland of Canada, which in winter is a white barrens, in summer is a grassy plain, with few trees, but rich grasses on which feed innumerable caribou, musk-oxen, and lesser sized animals. In fact there is so much grass there that investigators looking for a place for a reindeer herd to graze, found one 15,000 square mile area in the western Arctic near the Mackenzie River where the growth is heavy enough to take care of a herd of 250,000 animals the year 'round.

AT the settlements, where the long Arctic day averages upwards of 18 hours daily during the summer months, it is possible to grow a large assortment of vegetables, including potatoes, cauli-

flower, cabbage, tomatoes, radishes, onions, carrots, beets, lettuce, and cucumbers. In a region where canned food, dried meat, and fish form the staples, these fresh vegetables prove an attraction on the menu. Even wheat has been grown in the far north, and experiments are now being carried on to find a faster maturing wheat for that region.

Anyone expecting to find a barren region in the far north in summer has to change his mind when government reports state that beautiful blue lupines, yellow Arctic poppies, white and red saxifrages, blue forget-me-nots, Arctic daisies, rhododendron and other flowers dot the plains in summer. The Arctic is not entirely barren—at least not during the warm months.

EXCAVATIONS IN ANCIENT ATHENS

By T. LESLIE SHEAR, Ph.D.

Professor of Classical Archeology at Princeton University

THE past season's excavations in the Athenian Agora, which were conducted by the American School of Classical Studies at Athens, produced most important topographical results. The discovery of two buildings of which the identity is certain made possible the identification of all the more important buildings which had been hitherto cleared, and thus solved a long-standing and much debated archeological problem.

One of the new buildings is the Tholos, which can be identified with certainty because of its circular shape. It has a diameter of 60 feet. In the earlier records it is usually called the Skias. This word, meaning sun-shade or umbrella, was presumably applied to the building because of its conical roof. The Tholos was used as a dining hall for the officers of the Council and in it were deposited the standard weights and measures of the Athenian state under the guard of a public slave.

An official measure was found close to the Tholos. It is a round terra-cotta bowl of which the capacity is about two quarts. It is stamped with the seal of the city that is familiar from the coins—the helmeted head of Athena on one side and on the other the double-bodied owl. On its surface is painted the word "official." This may be the standard Attic dry measure, the choinix, which was the daily ration of wheat for the Athenian laborer. Standard weights were also found in the vicinity. One lead weight, which weighs 710 grams, is stamped with a dolphin and with the letters M N A. It presumably represents an Attic mina. Another lead piece with a cornucopia stamped on it weighs 74 grams, and a bronze weight, on which an owl is incised, has a weight of 69.9 grams.

THE second important building that was found is the Altar of the Twelve Gods. Its identification was provided by a statue-base, standing in front of it in its original position, which bears an inscribed dedication of Leagros, son of Glaukon, to the Twelve Gods. The building is located at the extreme north end of the west side of the American Zone of excavations, and the greater part of it extends beyond the area and lies beneath the tracks of the Athens-Peiraeus electric railroad. The investigation of this building gives an illustration of the



The statue of Aphrodite described in the article. Through sheer luck, it had been preserved



Official measure mentioned in the text, stamped with the city seal

difficulties inherent in archeological research in the heart of a modern city. For two weeks it was necessary to dig between the tracks with trains passing at ten-minute intervals. But the results were satisfactory and all the essential architectural details of the structure were secured. The altar was not only a sacred place of asylum but was also used as the starting point for measuring distances from the city.

With the position of these two conspicuous buildings definitely determined it has been possible to identify all the buildings on the west side of the Agora, in the order of sequence in which they are mentioned by Pausanias. Passing north from the Tholos they are the Bouleuterion, the Metroön, the temple of Apollo Pat-



The circular floor of the Tholos. Its discovery led to identification of nearby buildings. Theseum in background

roös and the Stoa of Zeus Eleutherios. Thus the whole topographical problem of the Agora has been clarified.

Among the many important objects discovered in the course of the past season a marble statue of Aphrodite is especially beautiful. The goddess is holding part of her cloak up behind her with her raised right arm and is resting her left arm on the trunk of a tree. A small figure of Eros is perched on her left shoulder. The statue was built into an early Roman wall which may date from the reconstruction of the city after its capture by Sulla in 86 B.C., and it is, therefore, certainly a work of the Greek period. From its style it should be dated in the 3rd to 2nd Century B.C. A head was lying in the wall by the statue. It is the type of an Aphrodite head and its size, style and technique are appropriate to the statue, but it does not make an exact join with the neck of Aphrodite. In the photograph it is shown attached to the statue by means of a layer of plasticene.

BY the end of the current season six of the sixteen acres in the American Zone had been cleared. The deposit of earth above the level of classical times varies considerably, but the average depth is between ten and fifteen feet, and during the four campaigns of excavation 60,000 tons of earth have been carted away. It is estimated that it will require five more seasons' work to complete the excavation of the entire area.

Where does the ether concept stand today? Next month this vexed question will be discussed.—The Editor.

A CHAPTER OF ACCIDENTS AND HOW

By HENRY NORRIS RUSSELL, Ph. D.

Chairman of the Department of Astronomy and Director of the Observatory at Princeton University
Research Associate of the Mount Wilson Observatory of the Carnegie Institution of Washington
Retiring President of the American Society for the Advancement of Science

TWO generations ago, when the spectroscope was new, a good deal of interest was excited by lines which appeared to be common to two or more elements. There seemed a chance at first that these lines might come from some fundamental constituent of matter contained in many kinds of atoms, but this turned out to be a dream. Some of the coincidences turned out to be due to traces of impurities in the "chemically pure" materials which had been used, and the chemists were not to blame, for the spectroscopic tests were far more sensitive than those which had previously been available. The rest proved to be mere chance agreement. When the spectra each contain thousands of lines, it will happen now and then that two quite unrelated lines of different substances fall so close together that even the most powerful instruments fail to separate them. Precise measures usually show that, though the two lines overlap, their centers are not exactly coincident. But occasionally the agreement is almost exact.

Cases of the sort have been a good deal of a nuisance to observers, for a lot of extra work has had to be spent to make sure whether one is dealing with a real though casual agreement of two different lines or an effect of impurity, and occasionally even the elect are deceived. (The great Rowland himself attributed a pair of solar lines to both iron and copper, when the latter one was responsible.) Again, only too often the investigator seeks some faint line in sun or star, only to find that it is hopelessly masked by some close and powerful neighbor. But never till now has such a coincidence of two lines helped to solve a problem instead of obstructing the way.

AT various times we have told in these columns of the steady advance in our understanding of the gaseous nebulae. Everyone knows now that the strong lines characteristic of these bodies, and very hard to match in the laboratory, come from familiar elements such as oxygen, nitrogen and sulfur, but are "forbidden lines" which are emitted only by atoms which have been left alone for long intervals—sometimes a second or even a minute. In an ordinary "vacuum" tube there are still so many

atoms that they bang into one another thousands of times a second and upset the process—which is not really forbidden but only dilatory. But the nebulae are so excessively tenuous that the atoms are no longer bothered by their neighbors, and have plenty of time to finish their jobs.

Most of the nebular lines are of this sort, but there are a few ordinary lines emitted by atoms which release their loads of energy within a hundred millionth part of a second or so, instead of having to wait millions of times as long. Hydrogen and helium (which have no forbidden lines, except one very far in the ultra-violet) show their ordinary lines. So do oxygen and nitrogen, but in this case only a few lines out of a wide spectrum appear. Those which show up are strong lines, to be sure, but others as strong or stronger are entirely absent, even though they are closely related to the others. It is as if one of the yellow sodium lines should appear without its mate.

SOMETHING queer must be happening, and Dr. Bowen, the discoverer of the forbidden lines a few years ago, has found out just what it is. To understand the remarkable chain of events we must refresh our minds for a moment and recall why these nebulae shine.

Gaseous nebulae are not incandescent like the stars—they are not even hot—and they would be quite invisible if energy were not steadily fed into them from stars near by. In the roundish planetary nebulae the "exciting" star forms the nucleus of the nebula itself. In irregular forms, like that in Orion, the star is near by but not itself within the gas cloud. Cooler stars merely light up the cloud feebly by reflected light, but a star which is as hot as 25,000 degrees at the surface starts things going. It emits a flood of very short ultra-violet waves. When these fall on the gas they are absorbed by the atoms and knock electrons out of them. The resulting ions may be hit by still shorter waves and have another electron removed, and so on. The free electrons fly about until, after hours or days, each meets some one of the battered atoms and recombines with it—by stages the newly formed atom settling down from one

state to another and giving off ordinary lines every few hundred millionths of a second, until it gets to a state from which it cannot go further except by means of a "forbidden" transition. Then it waits for a second or so, gives out one more quantum of radiation, and at last comes to rest in its normal state. We see the light given out by hydrogen and helium atoms which are doing this, doubtless because the gas is mainly composed of these elements.

SO much for the atoms; how about the radiation which they emit? The light given off in the earlier stages of the process consists of fairly long waves, and gets out of the nebula into space—for it can be absorbed only by excited atoms, and there are very, very few of these. But in the last step of the process the emitted light is of very short wavelength and is powerfully absorbed by any atom of the same kind in its normal state. Before it has gone far it will be trapped by some such atom, only to be released again and fly off in some other direction. After wandering thus, it will sooner or later get near the edge of the nebula and escape without being trapped on the way; but there will be a lot more radiation of this sort flying about inside the nebula than escapes from its surface.

For ionized helium, which is present in great quantities in the more strongly excited nebulae, the strongest line of the type just described is at 303.780 angstrom units. Now, by one of the accidents of which we spoke above, there is a line of oxygen (doubly ionized) at 303.799 angstroms. No spectroscope exists which could show the two lines separated. A quantum of light sent out by a helium atom may therefore be absorbed by an oxygen atom, raise it from its normal state, and load it up with energy. After a very short time it will unload, giving out light. This can happen in several ways, and there are various successive stages by which the original state may be restored. Even so, only a few of the many light-emitting processes of which the oxygen atom is capable are selected by this mechanism.

Now, exactly these lines (so far as they lie in the observable region) and no others, are found in the spectra of the nebulae. The mystery of the absence of

IT AFFECTS THE NEBULAE

the other oxygen lines is now cleared up. Nature has for once performed an experiment such as ingenious experimenters sometimes accomplish in their laboratories, and stored up a set of atoms in one alone of the many possible ways. Instead of "walking around on the keyboard of the piano" and playing all the notes at once (as Professor Wood once put it) she strikes on a single key and helps us to find how the machine works. But this is not all. There are a few nitrogen lines (again of the doubly ionized atoms) which show in the nebulae to the exclusion of their fellows.

Now Bowen's calculations show that many of the oxygen atoms which have been stirred up by the helium line, and have emitted the observed lines in the near ultra-violet, will then give out a line at 374.435 A ., while nitrogen atoms absorb lines at 374.434 and 374.442. This coincidence is even closer than the last, and there is no doubt that the nitrogen atoms are set shining in this way. Once again we find only the lines predicted by this theory.

Even in the marvelous realm of modern astrophysics nothing stranger than this has been found. Light from a hot star falls on helium atoms and is absorbed. Part of the energy is released as visible light, the rest as short waves which are absorbed by oxygen atoms which again give out visible light and

release short waves which stir up nitrogen atoms. It is a regular "house that Jack built!" Depending as it does on *two* fortuitous and almost perfect coincidences between lines of different elements, it is about as improbable an affair as could be imagined in a "random universe." But is the universe a random affair, anyhow?

BEFORE we leave the nebulae, we should report on some interesting identifications of other lines in their spectra. The strongest lines which remained unclassified a year ago (in the violet, at 3869 and 3967) were identified as forbidden lines of Ne^{III} (doubly ionized neon) by Boyce, Menzel, and Paine at Harvard and independently by the Swedish physicist Edlén and the Belgian, Swings. More recently a pair farther out, at 3346 and 3426, have been recognized by Edlén and Swings, and also by Bowen, as forbidden lines of neon, stripped of four electrons. To do so much to the atom requires very strong excitation—which explains why the images of a nebula, photographed (through a prism) with these lines, are the smallest of all. The very short light waves which have sufficient energy are absorbed before they can go beyond, while longer waves, capable of exciting lines of lower energy, get farther. Edlén and Swings have also found that two

faint nebular lines at 4711 and 4740 are almost certainly due to argon three times ionized. Like the rest, they are forbidden lines. In this, as in the preceding cases, the identification rests upon the prediction of the positions of these lines by comparison with known lines in other spectra of similar structure. This can now be done with considerable accuracy and there can be no reasonable doubts of the final results of this kind of comparison.

There is no danger, though, that the nebular observer will have to rest on his laurels and contemplate only a completed work. For example, Mayall at the Lick Observatory has studied a nebula (N.G.C. 4151) which looks like a spiral nebula on the photographs and has an enormous radial velocity, 950 kilometers a second (receding, like all the spirals). But its spectrum is predominantly gaseous, showing forbidden lines of oxygen, sulfur, and neon, including the high-excitation lines of Ne^{V} in the ultra-violet. There is also a continuous spectrum, apparently coming partly from very hot stars and partly from those of moderate temperature, like the sun. Hubble estimates the distance of this object as five million light-years. What gigantic masses of luminous gas must these be to reveal themselves at this distance!—*Lowell Observatory, Flagstaff, Arizona, July 30, 1934.*



Photo by Oscar S. Marshall

This month Professor Russell's article was written at Lowell Observatory, where he generally stops when en route to the Mount Wilson Observatory to do research work. View at Lowell Observatory. The nearly cylindrical dome of the 24-inch refractor shows between the trees. This refractor has an objective lens made by Clark and regarded by astronomers as the finest in existence. The Observatory also has a 42-inch reflector by Clark, a 15-inch reflector by Petidier, and a 13-inch photographic telescope. The dome which shows near the left of the picture is Percival Lowell's mausoleum. The Observatory lies at an altitude of 7250 feet, on a dry plateau. The grounds are covered with pine forest of dense young growth, which influences favorably the observing conditions, for it largely overcomes the disturbing effects of heat radiation

ALONG CAME A SPIDER...

The Little Black Widow Spider, Common in this Country, is More to be Feared than the Tarantula

By NELSON W. M. BAKER

WIDOWS, it has been said, are dangerous, but there is one widow that has been attracting my attention. She is beautiful, in her way, and her snare is always set for the unwary. The lady in question is none other than the black widow spider, *Latrodectus mactans*. She has other aliases in various sections of the United States, such as hour-glass spider, shoe-button spider, and similar appropriate or local cognomens. Her reputation is universally bad wherever she is found; which is, as entomologists and arachnologists agree, from New Hampshire to Patagonia in the Americas. In France, Italy, and Russia, particularly, her close relatives have been brought to the direct attention of scientists. All these forms are similar to our own black widow, so well known and so much discussed in the United States in connection with her venomous qualities.

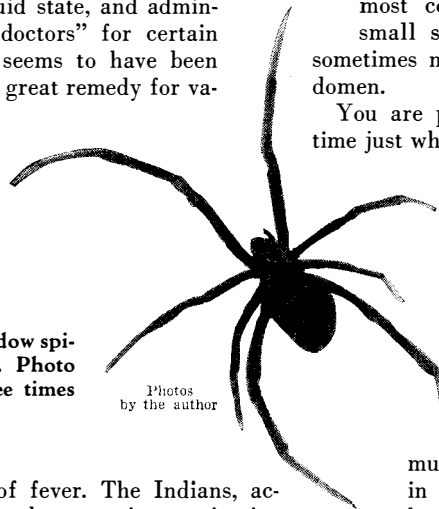
The arachnida, of which black widow is a member, is a group of animals that has been shunned by man as creatures of venomous mien, hiding away in dark corners waiting to sink virulent fangs into the flesh of any unfortunate soul who crossed their path. The group includes the spiders, scorpions, mites, harvestmen, and other more remote forms. The first two are familiar to most of us, either by name, picture, or reputation, if not by personal contact. Although in the tropics there are certain huge individuals of both the spider and scorpion families which can inflict serious and sometimes fatal wounds on humans and animals alike, in the United States there are only two spiders which we can consider really poisonous—the tarantula and the black widow. The latter is to be feared far more than the tarantula, whose bite occasionally results in blood-poisoning, not from his venom but from decayed matter on the fangs.

THE black widow is common in the United States, especially in the southern and southwestern states. In southern California last summer I can safely say that in at least eight out of ten instances I could produce from one to ten spiders from the dwellings and out-buildings in the suburbs of Los Angeles. About the outside foundation, garage,

and flower beds of my own home I counted over 25 of the ladies in one evening. Texas and the southern states have their share of widows, the spider being as prolific there as in California.

In Mexico and Lower California the black widow is greatly respected, even though her presence seems to be taken lightly. One writer states that in pre-modern times the bodies of *Latrodectus* were collected, mashed or ground to a thick fluid state, and administered by "doctors" for certain ailments. It seems to have been considered a great remedy for va-

The black widow spider is small. Photo enlarged three times



Photos by the author

rious types of fever. The Indians, according to another prominent scientist, were aware of the venomous nature of the spider, and developed a poison for their arrows from the mashed bodies.

The *malmignatte*, *Latrodectus treadinguttatus*, of Italy and presumably of other European countries, is similar to our "lady in mourning," but slightly smaller in size. She is greatly feared in southern Italy, and her bite is reputed to be fatal to dogs and live-stock. In certain seasons of the year the countryside is scourged by locusts, grasshoppers, and other pests, and at these times the *malmignatte* is over-abundant. It may be said in her favor that she preys on such vermin with avidity, rather than devoting her energy to biting human beings. Summing up the distribution of the dark and fearsome widow, she seems to be well known by reputation throughout the world, although her life, habits, and the exact character of her venom are known only to individuals of the scientific world.

Our American black widow is a beau-

tiful spider, as spiders go, and is much like a "shoe button" in size and shape, although some specimens measure up to half an inch in length. The unique feature in the lady's makeup, however, is the crimson hour glass on the under side of the abdomen, from which she derives the appropriate name hour-glass spider. This, together with her shining, ebony-black body, is her outstanding identification mark. On different individuals there is a variation in shape, size, and coloration of this mark. Some specimens have a single dot, others two disconnected marks, of red, yellow, and sometimes both colors, on the ventral aspect. However, the red hour-glass design edged with a thin margin of yellow is the most constant. In immature and small spiders the red or yellow sometimes nearly covers the lower abdomen.

You are perhaps wondering by this time just what sort of man the husband, or widower in the case is. In brief, he is one of those "Mr. Black Widow" personalities, thrust into the background by the fame of his notorious spouse. His body is smaller than that of the cannibalistic "amazon" female, measuring not

much over a quarter of an inch in length, and is of a lighter hue, with two or three white, reddish, or yellowish stripes running slantwise down the sides of the abdomen, and an uneven stripe of the same colors or darker down the center of the back, in addition to the markings of the female. The legs are generally banded with yellowish or reddish, and the palpa or feelers are bulbous near the tips. The species found in the south are the characteristic black, having a dark red stripe down the center of the back, with lines of the same color on the sides. In California the males I have observed have been lighter in color, with the whitish side stripes. Another, and seemingly more mature phase, is black, the back and side stripes a dirty white or grey. Altogether, variation in the male spiders is as general as in the so-called weaker sex, while in some instances immature males and females are indistinguishable. The fangs or nippers of the males are much smaller than those of the widows, but their poison sacs, or glands are fully as large. A scientist who has done much

experimental work with *Latrodectus* declares that the male spider is harmless to man, as the fangs are not capable of piercing the skin.

There is another species of this genus, grey in color, called *Latrodectus geometricus*, which has been found in California, but is extremely rare.

You will find the black widow under stones, in holes in tree stumps or in the ground, about garages, out-buildings, and frame structures in particular. They are averse to light, and so build their web in dark places. You cannot mistake the web once you have seen it. The strands are very coarse, and are spun in a haphazard, criss-cross fashion, the main cables generally running up and down, anchored at the ends by a network of smaller lines. From these main strands thinner cables stretch at all angles, making the web altogether the most unbeautiful snare of all the spinners' webs. One of the most common places to find the web of *Latrodectus* is along the sides of the foundation of frame houses. The web is spun from the board siding to the ground, so that the spiders may make their lair up between the foundation and the boarding. At night they can be seen hanging in mid-air on their coarse strands, generally upside down, making the red marking on the abdomen plainly visible. If an empty web is discovered, the spider may sometimes be enticed from its hiding place by lightly shaking the cables with a stick or finger. Believing that an insect has become entangled, it will come out to investigate. However, it can't be fooled in this manner more than two or three times at the most.

IT is a miracle to me that they can ensnare enough insects in their foolishly constructed web to provide food to keep them alive. I have on different occasions tried to lodge flies and other small insects in their trap without much success. The flies always drop through the wide openings between the strands. However, when some unfortunate insect does become trapped, it is interesting to watch the spider's methods of securing its prey. If the victim is too large or energetic to warrant a bold assault, the black widow will approach slowly, and warily wait for a chance to rush in, turn about, and throw a few strong loops of web around a wing or leg. When the victim's struggles become weaker the spider will advance again, and by perseverance will soon be able to give the insect a nip with its fangs. Immediately after the bite there is a pronounced lack of force in the movements of the spider's prey, followed shortly by its complete demise. Then *Latrodectus* cuts all lines holding the victim to the web proper, and carries it off to the den to devour at leisure.

Again, if the victim is small and more or less inoffensive, and has escaped from

the web and is crawling away, our spider acquaintance will hurry down a silken strand until close above the insect, then turn quickly and with its long rearmost legs attach a line to its prey, returning immediately to take a stand near the entrance to the lair, where it pulls the lassoed insect to its very door and despatches it.

apart. The spider quickly approached, but the commotion was such that he was nearly hurled from his position. He returned again and again, each time backing up as close as possible and throwing a line or two over the fly, securing it more firmly to the web. Occasionally he would make return trips up the web to repair and strengthen some section broken by the struggling fly. In the end he had completely subdued his victim and was enjoying a well-earned feast. This spider was in body no larger than the

fly's head, but he had courage back of his efforts. Of several males and females I have kept together in a large glass jar for some time, only two of the largest females are left. I provided them with a good supply of flies and small moths, but soon after becoming used to their prison the amazons made short work of the males and fed on them with evident pleasure. The two remaining females seem sociable enough but sometimes engage in either battles or play—it is hard to determine which. In crawling about their jar they approach each other and suddenly swing about, back to back, with abdomens raised high, and lash out pieces of web from their spinnerets with the four hindmost legs. They seem to be trying to entangle one another, but never fully succeed. After a time of such antics they go their separate ways again.

DURING the egg-laying season in June and July, the females spin three or four large white cocoons, which may be seen sometimes hanging in the web or under stones and old boxes. In these cocoons are some 200 to 300 tiny pearl-like eggs, which hatch in a few weeks. During the short time the newly hatched spiders spend in the cocoons there is a battle for survival, the stronger individuals devouring the weaker, until finally a hole is bitten in their round "incubator" and the young spiders crawl forth to face the world. They commence feeding then on any small insects or spiders that can be captured, the females becoming mature in some 60 days and the males attaining their growth more slowly. As far as I can ascertain, the old female spiders either die or disappear in nooks and crannies at the end of the warmer weather. The males seem harder to rear in captivity and they die in a short time, but it is reasonable to assume that their habits are similar to those of the widows.

The black widow would be insignificant—just another spider—if it were not for the venomous nature of her bite.

Spider Bite Victim Improves
BOISE, Idaho, May 31 (AP).—Slight improvement in the condition of Dr. William Erkenbeck, unconscious from the bite of a black widow spider, was reported today. Although still in a stupor from the poison injected by the biting spider May 20, he is swallowing liquid food and his physician said he appeared to be regaining consciousness.

SAVANT POISONED BY 'BLACK WIDOW'

By Associated Press

UNIVERSITY, Ala., Nov. 16.—For many years, arachnologists— they study spiders—have wondered whether the "black widow" spider was poisonous to human beings.

Dr. Alan W. Blair, 33-year-old associate professor of medicine at the University of Alabama here, can now answer that question with a loud affirmative.

Dr. Blair allowed one of the insects to bite his little finger. Two days of extreme pain in a hospital here was the result.

For 18 months the professor tried the insects on small animals. Dogs and cats were not affected. Guinea pigs were made sick and rats and mice died.

Dr. Blair said he was seized with violent abdominal cramps. His blood pressure sank rapidly. In extreme pain, he refused narcotics until his reaction had been registered on the electro-cardio-graphic table at the hospital.

This ordeal over, Dr. Blair went to bed and spent two days in intense suffering, despite continued injections of opiates.

Today he was back at home, weak and pale, but able to eat again for the first time since the experiment.

Newspaper clippings. Medical journals also mention serious cases of bites which occurred in outhouses

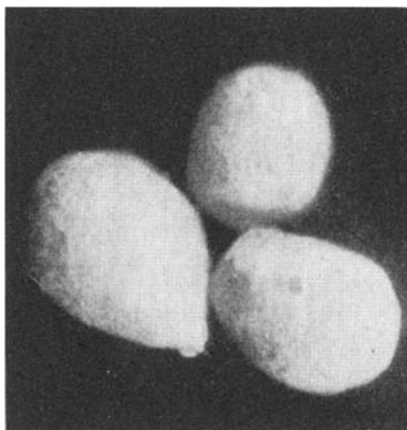
The male spiders, being so much smaller in size, find the capture of food more difficult, although they display more courage in their attack than the females. I managed to introduce an extremely large and half dazed green fly into the web of a small male spider. It buzzed lustily, all but tearing the web

Her reputation and notoriety are based on that, and it is the main point for consideration. Cases of spider bite—or arachnidism, the medical term—are reported each year from the southern and southwestern states, and of varying degrees of seriousness. In 1927 in California there appeared to be an epidemic of bites of *Latrodectus*, and many cases were assigned to hospitals. In 1932 a California physician stated before the assembled College of Physicians that there were “hundreds, and probably thousands of cases of spider bite yearly in the United States. Nearly 400 cases of black widow poisoning were actually reported, 20 cases being seen in a Los Angeles hospital in the past year.” He went on to say that “several death certificates were made out in California from this cause, and several others were reported in newspapers and personal communications.” According all due respect to this physician, I am inclined to believe his statement a bit exaggerated. In many instances cases of “spider-bite,” or black widow bite, are diagnosed on nothing more than circumstantial evidence, as the spider or insect accused of the biting is seldom seen, and if so it is not readily recognized by the general public. However, this California doctor made a statement in regard to the bite of black widow which is worth consideration: “Even though the mortality rate is low, the possibility of fatal termination cannot be disregarded.”

THERE is little doubt that the bite of the black widow is much more serious than that of other arachnids, and depends in effects on both the condition of the spider and the person who is bitten. The venom, unlike that of the scorpions, tarantulas, centipedes, and others of this family, does not affect locally, but through the blood system it quickly affects the entire body. This rapid action of the venom likens it to that of the dreaded rattlesnake, since it acts as a haemolysine, destroying the red corpuscles of the blood and coagulating the fibrin. From questioning, observing the symptoms of those persons actually known to have been bitten by *Latrodectus*, and by careful experimentation, science and the medical world have pretty well established some sound facts.

If one is bitten by this spider, he will not long be left in doubt. The immediate effect of the bite is an exquisitely sharp pain at the point of contact between person and spider. In an actual experiment made by a nery scientist in Arkansas a few years ago, he allowed himself to be bitten on the finger by a large female, with the following results: sharp pain at the seat of the bite, gradually extending up the arm and throughout the body. This condition grew worse and within about five hours he experienced difficulty in breathing and talking. He

had previously made arrangements with his physician and was taken to a hospital, where the reactions could be observed and charted. A low temperature, between 99 degrees and 100 degrees, accompanied these symptoms, with aching pains through the entire body, especially in the chest and hips. This condition persisted for about three days, hot baths bringing the most relief. He states that it took much patience and pestering to induce the spider to bite and that, although the experience was not a pleasant one, the adventure was worth the experi-



The cocoons of the black widow, enlarged approximately three times

ment. Some time later, while studying the male *Latrodectus*, this same scientist tried to encourage one to bite him on the inner side of the small finger. All the response he obtained was a slight nibbling. The spider seemed unwilling or unable to make connections.

A Russian scientist who in 1909 was an honorary curator of arachnology in an American museum, writes of this spider: “. . . one genus poisonous, that of *Latrodectus*, which has its representatives in all warm countries.” He mentions the *malmignatte* of Italy, saying, “it is probable that the convulsions following the bite of this spider are attributed to the fable of the tarantula.” In south Italy the famous dance, *tarentelle*, is supposed by legend to be the result of the bite of the tarantula. He goes on to say of *Latrodectus*: “The female is poisonous, the male harmless,” and tells of the research work of Professor R. Kobert of Rostock, who extracted the venom from these spiders by means of a salt solution and injected it into the blood systems of animals. He found the extract from a single spider sufficient to kill 1000 cats. This would indicate extreme potent possibilities, but when we consider the chemical action undergone by the venom during its extraction, it might well have much more killing power afterward than in its natural state. This is in a way proved by some later experiments on rats. The spiders in this instance were American black widows and the injections were made by the

spiders themselves. The rats immediately became groggy and showed signs of violent convulsions, but eventually recovered. It is possible that the spiders were low on venom, or that the fangs were not sufficiently embedded, but a second biting some time later showed the rats to be partially immune to the poison. We must also take into consideration that, although the effects of the bite of the European and Russian species of *Latrodectus* are considered similar, there may be some difference in the amount of potent quality of the venom, due to climatic conditions. Continued experimentation shows that the poison of *Latrodectus* is potent throughout the life of the spider, but it is reasonable to assume that in sickly or even healthy individuals there are times when the venom supply is low or weak and accordingly less potent in its effects.

Modern methods for treating the sufferer of our black widow bite are not what they should be at the present time, as far as I can ascertain. From communications with one of the head physicians of one of the largest medical centers in California I find that no definite serum or treatment has been established. Of the many persons admitted to that hospital apparently suffering from the bite of *Latrodectus*, only a very few could positively be classed as black widow victims; these brought the spiders with them. Their symptoms varied slightly, but in all cases intense pain seemed to be the main factor. Poulticing, hot applications, hot baths, and a general systematic treatment were used, recovery commencing in about two days. These patients were asked to return to the hospital in a few days so that some of their blood might be taken to make anti-toxin for the next victim. This, I was told, was the only serum that had ever been used, and as actual cases of black widow bite were few, no regular supply could be kept on hand under the circumstances.

ANTI-TOXINS, or anti-venins for “rattlesnake” bite are now on the market at an unreasonably high price and are standard equipment in all hospitals, doctors’ offices, and medical centers. There should likewise be serums for black widow bite. The venom of *Latrodectus*, if injected into the blood system in the quantity of that of the rattler, would be fatal in a much shorter time and, once bitten, it would be doubtful whether the victim could be saved by any treatment. Fortunately, however, *Latrodectus* has a limited amount of venom and is not aggressive toward the human race. Her nocturnal habits and her sluggish nature are points on our side and, with the exception of her venomous bite, she is a most interesting and beautiful spider.

DARK-ROOMS

And Dark-Room Technique for the Advanced Amateur Photographer

By A. P. PECK

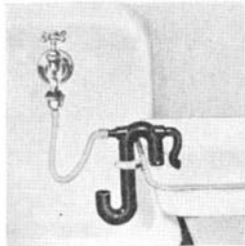
WHEN the amateur photographer has advanced so far in his chosen hobby that he wants to do the whole job himself—developing, printing, enlarging, vignetting, and so on—a modern dark-room becomes a prime necessity. Whether this be installed in the basement or a spare room, its arrangement and equipment will have a vital bearing on the satisfaction to be derived from the hobby.

The sidewalls and ceilings of the modern dark-room should be painted, keeping in mind the light reflective properties of the finished surface. This is of particular importance when panchromatic and superspeed films and plates are used. These emulsions are sensitive to light of all colors, but if all light except that color to which the eye is most sensitive be excluded, there will be a minimum tendency to fog. If, therefore, the walls and ceiling of the dark-room be painted with a material which will reflect a maximum amount of blue-green light, and absorb all other colors as completely as possible, a happy medium will have been reached. Such a paint is now available under the name of Panchromatic Green, compounded especially for dark-room use.

If an indirect light box, with a 25-watt bulb and a Wratten Series 3 safe-light, is used in a dark-room painted with Panchromatic Green, the amateur will be perfectly safe in handling the fast emulsions of modern films with little or no danger of spoilage.

Another paint for dark-room use has been developed for protecting and preserving surfaces against corrosion and the ravages of chemical solutions. This is known as Kodacoat and dries with a non-reflecting black surface. It is almost entirely inactive when dry and may be used to water- and chemical-proof tanks and trays, to paint all kinds of dark-room equipment, for floors, and so on. The coating is tough, non-brittle, non-porous, and has a rubbery feeling.

An excellent surface for table tops and benches is battleship linoleum cemented in place and thoroughly waxed.

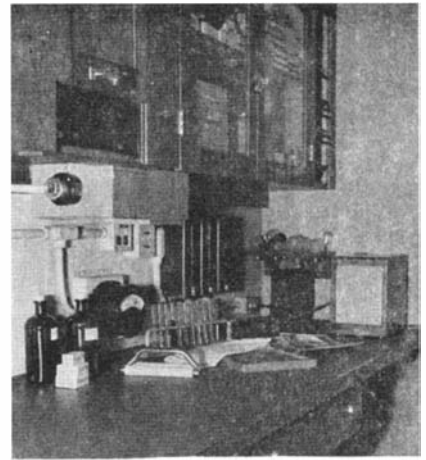


A siphon which converts a large tray into an efficient photo-print washer

Fluctuations in line voltages often make exact duplications of exposures virtually impossible. If, however, a rheostat is included in the printing lamp circuit, and a voltmeter connected across the lamp, the voltage may be adjusted to a point somewhat below normal—say 105 volts—and maintained at that value by the rheostat.

In making up stock solutions for photographic work, only the best and purest chemicals should be used. These must be kept in containers which are carefully labelled, stored in a definite place, and securely closed when not in use. Accurate scales should always be used in weighing batches of chemicals and the solution should always be mixed exactly according to directions. The order of mixing should be faithfully followed when dissolving the chemicals, and finally water should be added to bring the solution up to the required volume.

The amateur will find it good practice to filter all solutions before use, to remove any particles of foreign matter which might settle on films or paper and cause spots. A simple filter may consist of several layers of muslin in a glass funnel. If there is very much organic matter in the water supply, it is advisable to install a filter on the tap. The very best results are to be had when dis-



Photos courtesy Eastman Kodak Company

A corner of an amateur photographer's dark-room, showing rheostat for controlling the lighting circuit, and voltmeter mounted on the wall

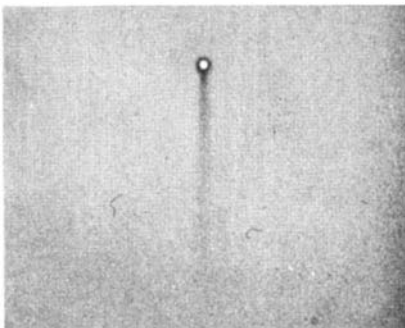
tilled water is used for mixing solutions.

Thorough washing of prints is an absolute necessity for good work, but is often slighted. A device which insures proper washing is illustrated on this page. It is a siphon which may be used with any large tray and which introduces fresh water at the top of the tray and siphons out the chemically laden water from the bottom.

Most markings and stains occasionally found on films after developing and fixing may be avoided by following these three simple rules: (1) Maintain all solutions as near a temperature of 65 to 70 degrees, Fahrenheit, as possible. (2) Discard a solution as soon as it shows signs of becoming exhausted. (3) Agitate all materials when first immersing and at intervals during treatment.

The film spot shown in the illustration in the lower left-hand corner of this page was caused by a bubble of air trapped at the film surface, and could have been avoided by observance of rule 3. The water spots shown below could have been prevented by wiping the film carefully with chamois, and drying without excessive heat.

References to other literature on the subjects of dark-rooms and dark-room technique will be furnished on receipt of a 3-cent stamp to cover postage.—The Editor.



Right: An air bubble trapped on the surface of the film caused this spot. Left: Water spots on drying films are often caused by excess heat



THE FOLLY OF

By IGNATIUS W. COX, S. J., Ph. D.

Professor of Ethics at Fordham University

NO sensible man can be opposed to the aim of eugenics, the health and happiness of future generations. The attempt, however, to attain this end by a means unjustifiable on scientific or moral grounds, and hence, fundamentally on legal grounds—namely, by human sterilization—will meet the opposition of those who give the subject profound consideration. "Biology has become popular," writes H. S. Jennings, of Johns Hopkins University, in his "Biological Basis of Human Nature," "but the enthusiasm of the biologist at this Utopian situation is dampened by doubts and worries as to the soundness of some of the maxims that are circulated in the name of biology. . . . The situation is one that gives wide opportunities to the cocksure and uncritical, to those who are not troubled with doubts as to whether their science has solved the problems of humanity."

Advocates of sterilization seek the "elimination of the undesirable elements in society, along with the burden so long imposed upon us by their multiplication and their helplessness."¹ But how determine what are the "undesirable elements"? It is the way with some eugenicists to judge *eugenic value* by *social standing*, *economic competency*, and the amount of *formal education* received. Social standing, however, is not virtue; economic competency may imply crime; and formal education has cultivated at times many shady acquaintances.

SOME eugenicists are prone to confuse education with intelligence; cleanliness with good living; ignorance with vice; and mental deficiency with the slums. Raymond Pearl, Director of the Institute for Biological Research of Johns Hopkins University, concludes an article in the *Quarterly Review of Biology*² on "Differential Fertility" with these words: "The present paper is intended, in part, to show that the eugenic condemnation of whole social or economic classes, either directly or inferentially by the contention that only certain classes such as college graduates are eugenically desirable, is unwarranted by anything now known."

But apart from this there are certainly unfortunate individuals, both in the higher and lower classes, suffering from deficiencies physical and mental. They

may be divided approximately into six groups: (1) the infectious or contagious, such as tuberculars, syphilitics, and lepers; (2) the degenerates, such as sadists and drug habitués; (3) the delinquents, such as waywards and criminals; (4) the dependents, such as the deaf, the deformed, the blind; (5) the mentally diseased; (6) the mental deficient, such as morons and idiots.³

Now what is the scientific possibility of eliminating such unfortunates from the human stock by sterilization? First of all we must be able to determine scientifically whether the deficient characteristic is acquired or inherited. It is generally accepted by biologists that acquired characteristics are not transmissible by heredity. But the first four classes represent those whose deficiencies are admitted, for the most part, to be acquired characteristics. Many of these deficiencies can be remedied by institutionalization, by therapeutics, and by education. With regard to crime, C. B. Davenport, Director of the Department of Genetics, Carnegie Institution of Washington, writes under the caption, "Crime, Heredity and Environment," that "Prompt and painful punishment is the best panacea for crime."⁴

THIS leaves for our consideration the last two classes, those mentally diseased and mentally deficient. With regard to mental disease, Myerson⁵, a great authority, declares that "only a few of the major mental diseases . . . are hereditary or, to use a more exact term, familial. . . . Just two important psychoses run in families. . . . These are dementia praecox and manic depressive psychosis. The latter is by far the more likely to appear in several members of a generation and to appear in more than one generation. But many cases of even these diseases appear as *isolated* characteristics of one individual and cannot be linked up with *mental disease of the family*, or appear without any *hereditary* linking up which is worthy of the name. . . . Further, very few cases are reported where mental disease of this type ran for many generations. A few cases of three-generation disease are recorded, only one or two where four generations were mentally sick. It appears that mental disease, like physical disease, either *destroys the stock which it at-*

tacks, or there is final recovery."

"The causes of mental diseases are still an unsolved mystery," declares Landman.⁶ Even Paul Popenoe, an advocate of sterilization, admits that the prolificity of the mentally diseased is low⁷ and that the marriage rate of such of both sexes is below that of the general population.⁸ Besides, many of the mentally diseased require institutional care and in that case there is no meaning to sterilization.

It is the last class, including all kinds of feeble-mindedness, which gives particular concern to the pessimistic eugenicist, and against this class the weapon of sterilization is particularly aimed. But we know little, if any more, about the transmission of feeble-mindedness through heredity than we do of the heredity of mental disease: "Much of feeble-mindedness is environmental in origin," says Myerson⁹, "much is hereditary, but most is of unknown origin, and may represent the inexplicable, downward movement of intelligence, just as genius represents its inexplicable upward movement."

"BOOKS have been written on the menace of the feeble-minded," remarks the same author. "It is alleged that they are the criminals and the prostitutes of the land and their great prolificity makes them the potential population of the world, if one theory or another were not done to them. It is 'proved' that their royal families, the Jukes, Kallikaks, Ishmaels, Nams, are the chief reasons for the high cost of living, and normal folk slave to build prisons, feeble-minded schools, hospitals, courts, poor farms, and the like for these people and their descendants. Now the Jukes, the Kallikaks, and so on, are bad enough, but it has *not been proved* that they are *really* feeble-minded, and it is not true that, even if they are feeble-minded, they are typical of the bulk of cases of feeble-mindedness. . . . Such families as the Jukes, Kallikaks, Nams, tribes of Ishmaels, are not representative of feeble-mindedness, if we may judge by our studies of some 860 families in Massachusetts. . . . We found nothing like the prostitution, crime, and general unfitness recorded in these families. Elsewhere, I have criticized the totally indiscriminate way in which *low*

HUMAN STERILIZATION

cultural level has been called *feeble-mindedness* in the case of these families. . . . Personally I find it hard to evaluate individuals after a long acquaintance with mental and physical disease."¹⁰

With regard to the so-called prolificacy of feeble-mindedness we read in the British Governmental Report to the Departmental Committee on Sterilization¹¹, 1933: "The supposed abnormal fertility of defectives is, in our view, largely mythical and results from the accident that from time to time distressing exceptions to the general rule find their way into the courts and are introduced in the press." Besides, as Landman writes¹², "In a study of 605 case histories of the feeble-minded in the same state (California) 34 percent of the males and 28 percent of the females were still institutionalized." Sterilization for these simply does not make sense, unless there is claimed for it therapeutic value, for which there is no proof. The fear, therefore, that the mentally deficient are giving a wholly disproportionate contribution to the community in a differential birth rate favoring feeble-mindedness, simply does not stand up in the light of any known scientific facts.

BUT let us assume that we know more about the cause of mental disease and mental deficiency than we actually do. Let us pass over for a moment the statement of Landman¹³ that, "These serious criticisms of the present status of eugenics show its great need for more science and less speculation. . . . Human sterilization, as a social program, requires more scientific evidence." Let us transmit for the moment what S. J. Holmes, himself in favor of sterilization, admits: "In reading the productions of my fellow eugenicists I not infrequently meet with statements which cause me to squirm. It must be confessed that much of the literature on eugenics, in the present infancy of this science, is characterized by *hasty generalization* and *uncritical overstatement*."¹⁴ Suppose we knew just what deficient human characteristics are inherited and what are acquired. To eliminate, to any large extent, the undesirable characteristics by sterilization,

we would have to know more about the method by which such defects are transmitted by heredity.

Some biologists accept the gene theory as a means of explaining the hereditary transmission of *human characteristics*. The gene theory is applied to human beings only by analogy, an inconclusive application. Jennings warns

THE fallacy that inferior individuals must have come from inferior ancestors is well illustrated by the well-known case of Elizabeth Tuthill Edwards, a colonial dame. Speaking of her, Professor H. H. Newman of the University of Chicago says in his book, "Evolution, Genetics and Eugenics": "She was divorced from her husband on the ground of adultery and gross immorality. The evil trait was in the blood, for one of her sisters murdered her own son and a brother murdered his own sister. Richard Edwards (the first husband of Elizabeth Tuthill) married again after his divorce and had five sons and one daughter, but none of their numerous progeny rose above mediocrity." Harvey Wickham, in "The Misbehaviorists," in speaking of the same Elizabeth Tuthill Edwards, says: "So if the eugenicists had been in control 300 years ago . . . Elizabeth Tuthill would have been refused a marriage license even had she escaped a worse fate. Crime and insanity seemed to have marked her for their own. And yet it was from her . . . that descended Timothy Edwards, one of the founders of Yale University, 12 college presidents, 265 college graduates, 65 college professors, 60 physicians, 100 clergymen, 75 army officers, 60 prominent authors, 100 lawyers, 30 judges, 80 public officers—state governors, city mayors and state officials—three congressmen, two United States senators and one vice-president of the United States, Aaron Burr, Mrs. Eli Whitney, Winston Churchill, Edith Carow, widow of Theodore Roosevelt, the Marchioness of Donegal, Morrison R. Waite, former Chief Justice of the United States, George Vincent, head of the Rockefeller Foundation, Grover Cleveland and U. S. Grant."

Wickham quotes as his authority for these statements Horatio Haskett Newman of the University of Chicago and Albert E. Wiggam, author of "The Fruit of the Family Tree."

—The Author

us against this type of argument in his list of biological fallacies of which the first reads: "The fallacy of non-experimental judgments in matters of heredity and development."¹⁵ Hence an attempt has been made to support this theory by an appeal to intelligence tests and family trees. Of course this is not a scientifically biological procedure. Besides, intelligence tests are uncertain and frequently based on different methods, while family trees do not yield the same results to different investigators.

In the light of the gene theory, what

can we expect of sterilization as a means of eliminating deficient characteristics and specifically feeble-mindedness, the chief concern of the advocates of sterilization? On this theory, if two good genes or one good and one deficient gene were paired in the same germ cell the effect would be normality in the resultant individual. Now there are very many men and women who carry one of these deficient genes which tends to produce feeble-mindedness. Only when this one deficient gene from the male unites with a like deficient gene from the female in the same pair would the offspring be deficient. Those who have one deficient gene are called carriers and are themselves normal. It is a *guess* that there are about 10,000,000 carriers in the United States; we have no scientific knowledge for the detection of carriers.

IT has been computed that if the proportion of feeble-minded in the population is one per thousand, to decrease that proportion to one per ten thousand will require about 68 generations, or two to three thousand years, if it is done merely by stopping the propagation of feeble-minded individuals."¹⁶ The reason is that feeble-mindedness, on this theory, would still be largely propagated by normal carriers of the defective genes. Jennings thus concludes: "For more effective action than is now possible for improving the race through eugenic measures, and particularly for getting rid of marked single gene defects, two great advances in knowledge and practice are required."¹⁷ The first of these is to discover means of identifying normal carriers of defective genes. The second is to know more about what human troubles are due to single-pair gene defects. "The great difficulty about this is that bad living conditions often produce the same kind of results that bad genes do. Persons may become idle and worthless, insane or criminal or tubercular—either through bad genes or bad living conditions, or through a combination of both."¹⁸

But suppose these favorable discoveries were made, still I do not think the problem would be solved for the steril-

izers. And this is a matter which nowhere have I found adequately discussed. How did the deficient genes originate in the race? Are human beings producing within their own vital organisms *new* deficient genes which they pass on to their progeny? Certainly biology discusses in lower forms of life the mutation of genes by X ray and perhaps by radioactivity from the earth. Are there in man other circumstances which may mutate the genes, from the combination of which the inherent constitution of the individual is supposed to arise? Is there a possibility of the mutation of human genes by the emotional and mental states of parents? To these questions biology, I think, has no certain answer one way or the other. If *new* deficient genes are being produced as rapidly as the *old* ones can be removed by sterilization, then the sterilizers are similar to a group of men who are trying to drain a lake when as much water is flowing into it as is being drained off.

HERE, I would call attention to two other fallacies listed by Jennings¹⁹: "The fallacy that preventing the breeding of hereditary defectives will largely or entirely get rid of such defectives in later generations" and the fallacy "that superior individuals must have come from superior parents; and that this will continue to happen." Raymond Pearl sums all this up in the "Present Status of Eugenics"²⁰: "In preaching as they do, that 'like produces like,' and that therefore superior people will necessarily have superior children and inferior people inferior children, the orthodox eugenists are going contrary to the best established facts of genetical science, and are, in the long run, doing their cause harm. . . ." "But, on the record, something of the order of 95 percent of the greatest philosophers, poets and scientific men that have actually appeared during the history of our race *would never have been born*, because the people who were in fact their parents would not have been allowed to breed under such a régime." (Meaning "eugenic" régime—*I.W.C.*) Raymond Pearl has some strong things to say²¹ about propagandists for eugenics: "Leaving aside all discussion of what might be called the broad humanitarian aspects of these eugenic theses . . . I wish to submit that they are all based upon and derive their entire meaning from what is now known to be a profound fallacy."

ADEQUATE discussion of the ethical side of sterilization is here impossible for want of space. It is susceptible of positive, rational proof that sterilization is unethical and immoral. If man is not obliged by moral law to do good and avoid evil in the use of his freedom,

then there is no such thing as morality; and man, on that hypothesis, has a right to abuse his own faculties and those of others; to lie, to steal, to murder, to the limit of his physical possibility. The moral law obliges man to use his faculties in accordance with the finality written in their nature. To use a faculty and to positively frustrate its finality is to *use* that faculty to *abuse* it. That is why lying is wrong. That is why voluntary sterilization is wrong. To say that sterilization leaves the sex faculty un-

THIS is the last of four articles on human sterilization. The others appeared in the June, July, and September numbers.—Editor.

impaired is to utter an absurdity. The sex faculty is changed by sterilization as radically as the powers of speech would be changed by an operation which permitted the emission of sounds but prevented the finality of speech, namely, purposeful utterance. Sterilization is a mechanism to allow use of the sex faculty, while frustrating positively the primary purpose or finality given to it by Supreme Intelligence. One may legitimately refrain from the use of a faculty, as of speech or of sex. It is quite another thing to use such faculties and in their use to provide positive means for the frustration of their primary purpose, as happens in the case of lying and sterilization.

JUST as it is wrong to submit to voluntary sterilization, so it is equally wrong for the state to command sterilization. Such a command implies the immoral doctrine of the absolute state, that man is for the state and not the state for man. Hence the decision of Justice Holmes in the now famous *Carrie Buck* case is indefensible on ethical and moral grounds. Of course that decision is not binding in conscience. The state for legitimate reasons may prevent the use of an individual right, by segregation, for instance; but this does not and cannot imply the right of the state to *destroy by mutilation* the finality of the faculty which is the *basis* of the individual's right.

And so the "case for sterilization" breaks down all along the line. It simply does not make sense. Emotion has been substituted for reason, and wishful thinking for scientific procedure. The case for sterilization breaks down in its attempted classification as to what are the best eugenic breeds and what not. It breaks down in its attempted classification of hereditary as completely divorced from environmental characteristics. It breaks down in its attempt to show that sterilization would make any appreciable difference in the number of

"undesirables" in the future. And hence its economic argument breaks down. Since there is no evidence that man will be able to reduce by sterilization the number of unfortunates in the future, the savings indicated by that method are wholly problematical. As a matter of fact, sterilization stations, birth control clinics, and parole officers are all included in the eugenic program, with expenses actually increased. And add to this that a great number of those actually sterilized would still require institutionalization.

Let us not forget the fact that there are certain lines of procedure which are legitimate and effective as eugenic measures. There are two especially which will make for healthier and happier living for ourselves and posterity. These are the elimination of war and social injustice. Sir George Peel states that 70 percent of the budgets of five great powers is employed either in paying for past wars or preparing for future ones. War is disgenic. It brings with it an ever-widening trail of death, disease, insanity, neuroses, economic and financial confusion. Social injustice is, in large measure, responsible for our slums, for disease, for helplessness in human life, for despondency and consequent neuroses. In this country it is possible to produce enough that all may live well, if the wealth we produce is properly distributed through a cultural wage, and not allowed to concentrate in the hands of a few. And notice this: that war and social injustice are too often the result of the leadership of those who are supposed to be of the best eugenic breed: the educated, those of social standing and of economic competency. To pass over war and social injustice in the hope of eradicating human ills by sterilization may be good propaganda; certainly it is bad eugenics.

¹⁹"The Case for Sterilization," by Leon F. Whitney, page 8.

²⁰March, 1927, Vol. II, page 117.

²¹"Human Sterilization," J. H. Landman, page 128.

²²*Journal of Heredity*, Vol. 19, 1928, pages 307-313.

²³"The Psychology of Mental Disorders," A. Myerson, pages 116-117.

²⁴"Human Sterilization," J. H. Landman, page 146.

²⁵*Journal of Heredity*, 1928, pages 73-81.

²⁶"Marriage Rate of the Psychotic," in *Journal of Nervous and Mental Diseases*, Vol. 68, 1928, pages 17-27.

²⁷"The Psychology of Mental Disorders," A. Myerson, page 123.

²⁸The same, pages 121-123.

²⁹Page 18.

³⁰*Scientific American*, June, 1934.

³¹"Human Sterilization," J. H. Landman, page 197.

³²"The Eugenic Predicament," S. J. Holmes, page 124.

³³"The Biological Basis of Human Nature," H. S. Jennings, page 206.

³⁴The same, page 242.

³⁵The same, page 249.

³⁶The same, page 250.

³⁷The same, page 218.

³⁸"The Present Status of Eugenics," page 20.

³⁹The same, page 10.

STEEL ARTERIES FOR BOULDER DAM

By R. G. SKERRETT

WHEN the last of the 7,000,000 tons of concrete composing Boulder Dam has been placed and that titanic barrier has bound together the two walls of Black Canyon, a reservoir will have been formed reaching upstream for 115 miles and capable of impounding 30,500,000 acre-feet of the Colorado River's flow. The completion of that monolithic wedge will rob the flood periods of that great stream of their destructive force and confine those otherwise tumultuous waters so that they cannot sweep onward unchecked to their ultimate goal, the Pacific Ocean. But the Government engineers will then have achieved only part of their threefold purpose.

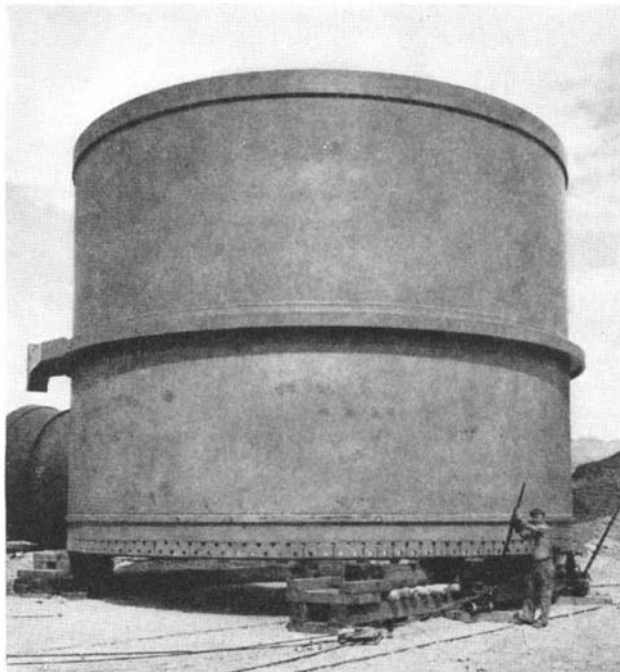
The public generally believes Boulder Dam to be designed merely to curb the Colorado River. This is a misconception of the undertaking as a whole. The flow of the river varies greatly in volume from season to season. There are periods when less than 3000 cubic feet of water flows through the canyon where the dam is now rising; then suddenly, when melting snows and torrential rains in the distant mountains drain into the tributary streams, the Colorado may flow at a rate of fully 300,000 second-feet! Large as is the total annual volume of flow, these great differences mean that dependent husbandmen on the irrigated areas contiguous to the river in Arizona and California—especially in the Imperial Valley of the latter state—may still be desperately hard put to it because there is not sufficient water immediately available to satisfy the needs of their growing crops. On the other hand, when the river is on a flood rampage, they may have to battle day in and day out for weeks to keep the river from breaking through defensive earthworks and inundating their farms, their homes, and other buildings.

MANIFESTLY, the Boulder Dam project must serve to impound flood waters that would otherwise go to waste; and then it must make it possible to release those arrested waters into the river below the dam so that a sufficient volume shall continue onward

to meet all the requirements of people now dependent upon this stream, as well as those that shall draw from the Colorado in the future. This provision calls for flow regulation, day in and day out the year 'round, that will insure a more even flow in the river below Black Canyon than has been the case with the Colorado uncurbed. This regulation is as vital to the successful service of the

Angeles and 12 associate communities that will thus obtain twice as much water as they now consume. This abundance will take care of their water needs for decades to come.

Before describing the extraordinary system by which water held in restraint by Boulder Dam will be returned to the course of the river under continual control, it may be well to sketch the needs of the people living in the Imperial Valley as well as those occupying the area embraced within the Metropolitan Water District of Southern California. At the present time, about 75,000 people resident in the Imperial Valley are directly or indirectly benefiting from the 500,000 acres of irrigated lands that are now under cultivation and which produce crops having an average annual value of 100,000,000 dollars. Another half million acres of irrigable lands in the Imperial Valley can be made productive, and thus double the marketable output and the number of people that can be gainfully employed there.



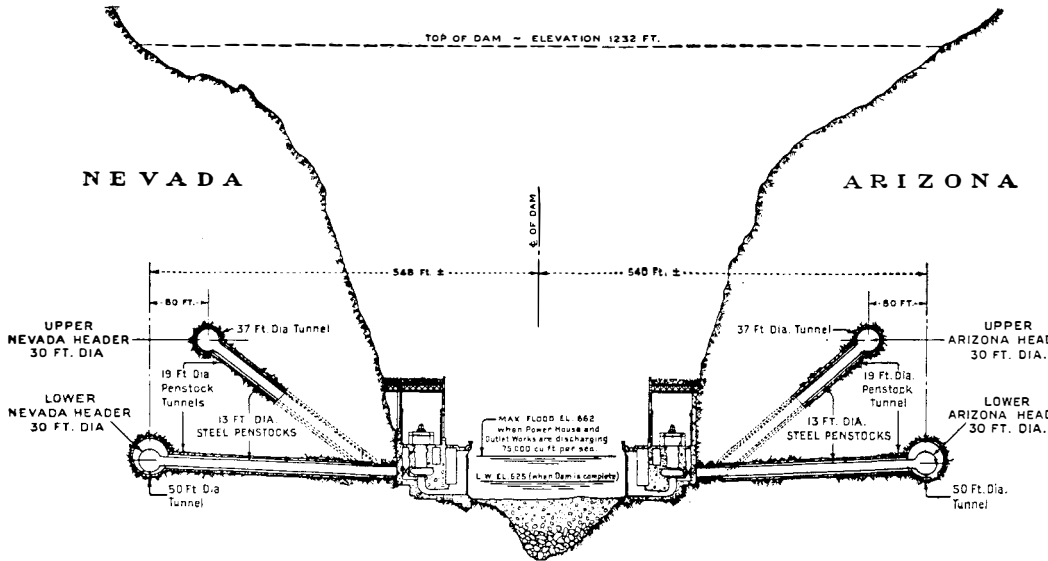
One of the huge pipe sections, ready for lowering into Black Canyon for installing in one of the great tunnels

project as halting the seaward surge of floods.

The generation of power is incidental to the broad scheme, but it provides a way to reimburse the Government so that the undertaking will pay for itself without levying upon the nation's taxpayers. When fully equipped, the Boulder Dam power plant will be capable of generating a maximum of 1,835,000 electric horsepower; the current, to be sold at an extremely low price, will refund the first cost plus interest, provide funds for maintenance, and insure a handsome surplus within 50 years. This cheap electricity will be a boon to industrial and domestic consumers located within the far-flung range of distribution, and the energy will also be utilized to help pump water from the Colorado over intervening mountains on the 241-mile journey from the river to the terminal reservoir that is to supply Los

TO this end, the All-American Canal, which is to trace its course throughout above neighboring Mexico, will take water from the Colorado River and deliver it to both the Imperial Valley and the Coachella Valley. The main section of this waterway will be 80 miles long and is to have a maximum capacity of 15,000 second-feet. From that artery there will be a branch canal, 130 miles long, that will extend into the Coachella Valley. Work on the All-American Canal is to start shortly, and that great ditch will relieve American farmers from dependence upon a canal that now leads the water to them after first flowing through a nearby section of Mexico. The construction of the Colorado River Aqueduct is going forward rapidly, and is being built large enough to deliver at the terminal reservoir in southern California a maximum of one billion gallons a day.

Through a unique and stupendous arterial system the regulated flow of the Colorado will move to the big water wheels in the power house at Boulder Dam or be returned directly to the



Schematic diagram showing a cross-section of Black Canyon at the power house. Steel headers are shown in their tunnels. Fifty-foot spillway tunnels (not shown) are off to left and right of picture

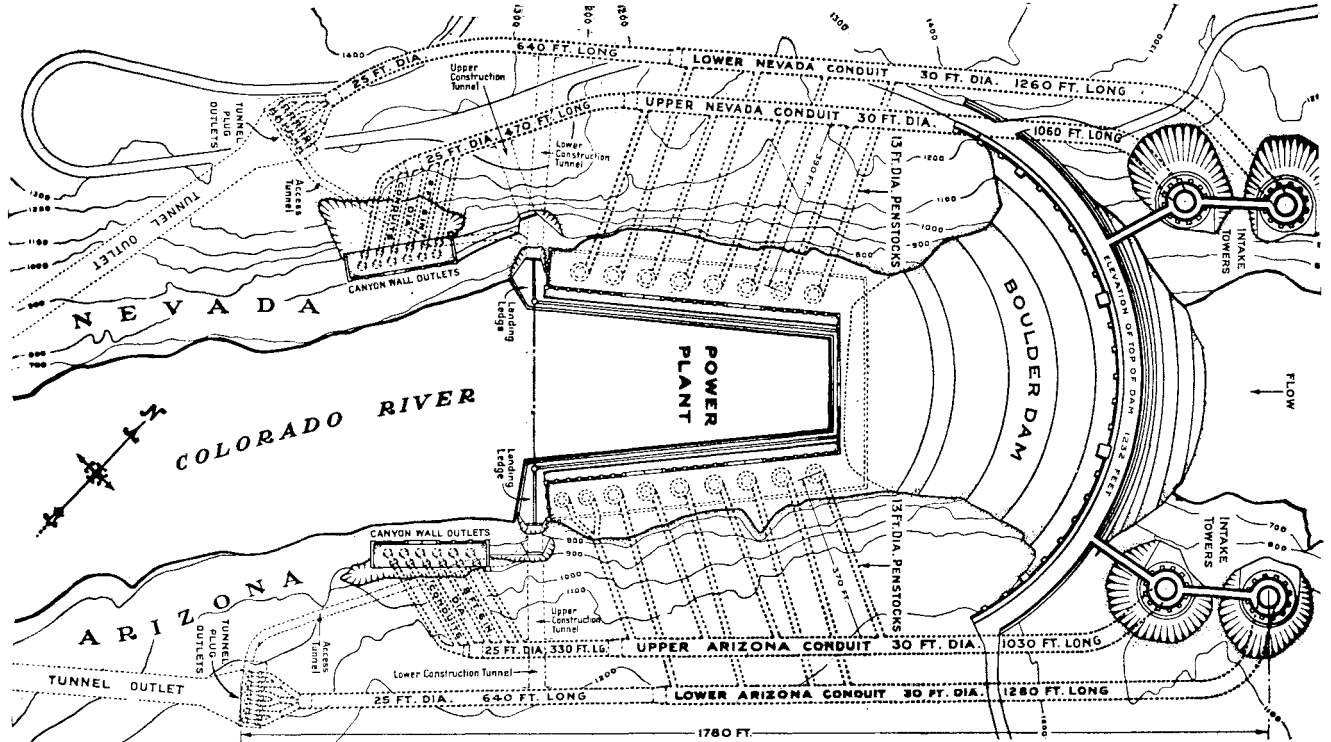
course of the river below the dam through four groups of immense balanced needle valves. In any case, and under all conditions, the volume of water that may be used to generate electrical energy, or return to the stream through the great outlet valves, will be sufficient at all times to insure an ample supply for our own people and for our Mexican neighbors who rely upon the Colorado for water. The fabrication and the installing of the steel conduits of this extraordinary regulatory system are the outcome of much intensive and unusual scientific research. One by one, difficulties have been overcome, puzzles have been solved, and technical aids devised that render possible the rapid prosecution of the task and the maintenance of exacting standards of workmanship.

When the basin above Boulder Dam

is filled, the level of the lake will be 590 feet higher than the turbine inlets; at the lowest operating level, the water will be 420 feet above the power wheels. The average working head will be 520 feet, and the static pressure at that stage will be about 225 pounds per square inch. Water at that pressure would be sure to seek out even the smallest avenue of escape and, perhaps, quickly enlarge such a channel. The Bureau of Reclamation, therefore, decided not to subject the walls of rock-driven tunnels to such high pressures, even should the tunnels be heavily lined with concrete, because they feared that the enveloping rock in places might yield, the lining crack, and the water escape and damage either the dam itself or some of the associate works. It was necessary to find some other system of distribution.

After extensive tests with models,

large and small, and much other research of an exceptional character, the technicians recommended the use of steel arteries to carry the water, and that the sturdy piping be housed in rock-driven tunnels of sufficiently greater diameter than the conduits to permit the exterior of all the piping to be inspected at regular intervals. The largest of these conduits have an inside diameter of 30 feet and a wall thickness of $2\frac{3}{4}$ inches. The lesser of the pipe sections are $8\frac{1}{2}$ feet in diameter, and their walls are formed of steel plates $\frac{5}{8}$ of an inch thick. In its entirety, this unprecedented system will be made up of 14,500 linear feet of piping fabricated from 45,000 tons of steel plating. Since May, 1933, the multiple sections have been under construction in a big plant erected for the purpose at Bechtel, Nevada, about a mile from Boulder



Plan of Boulder Dam showing conduits and headers

Dam. These sections are being placed in their designated tunnels, and the first of the great 30-foot sections have recently been installed at the bases of the four monumental intake towers. That accomplishment represents a truly climactic stage in this part of the Boulder Dam project.

The contract for the conduits was awarded to The Babcock and Wilcox Company. For the contract sum of approximately 11,000,000 dollars that company undertook to fabricate near Boulder Dam and to install in the several rock-driven tunnels conduits having the following principal characteristics:

Length, ft.	Diameter, ft.	Plate Thickness, in.
4700	30	$1^{11}/16-2^{3}/4$
1900	25	$1^{5}/8-2^{5}/16$
5600	13	$1^{5}/16-1^{5}/16$
2300	$8^{1}/2$	$5/8-7/8$

ALL plates are bent cold by a powerful set of vertical rolls; and the edges of the plates are made ready for joining by electric welding on a planer that has a bed fully 40 feet long. Each erection-section of 30-foot pipe—a section being 24 feet long—is composed of six plates, 12 feet wide and about 32 feet long. One such section, when ready for installing, weighs approximately 140 tons. Two of these heavy plates weigh 46 tons and constitute a carload when in transit from the steel mill in distant Indiana.

All seams of every erection-section are fusion welded; the bonding seal is deposited by an automatic welding machine that represents years of development. The intense heat of the electric arc fuses simultaneously the edges of the plates to be joined as well as the welding metal that binds them together, and the welding metal is deposited in successive layers until the groove between the plate edges is filled. By forming the mass of the weld progressively, the underlying layers are annealed by the heat of the succeeding layers, and, finally, a weld is produced that is composed of fine-grained and very strong metal. The welding metal is in the form of rods or electrodes which are coated with a material that, in fusing, temporarily spreads a sheltering film of slag over the molten metal. In this way, the oxygen and nitrogen of the atmosphere are excluded from the still fluid steel, which might be impaired if it were exposed to either of those gases.

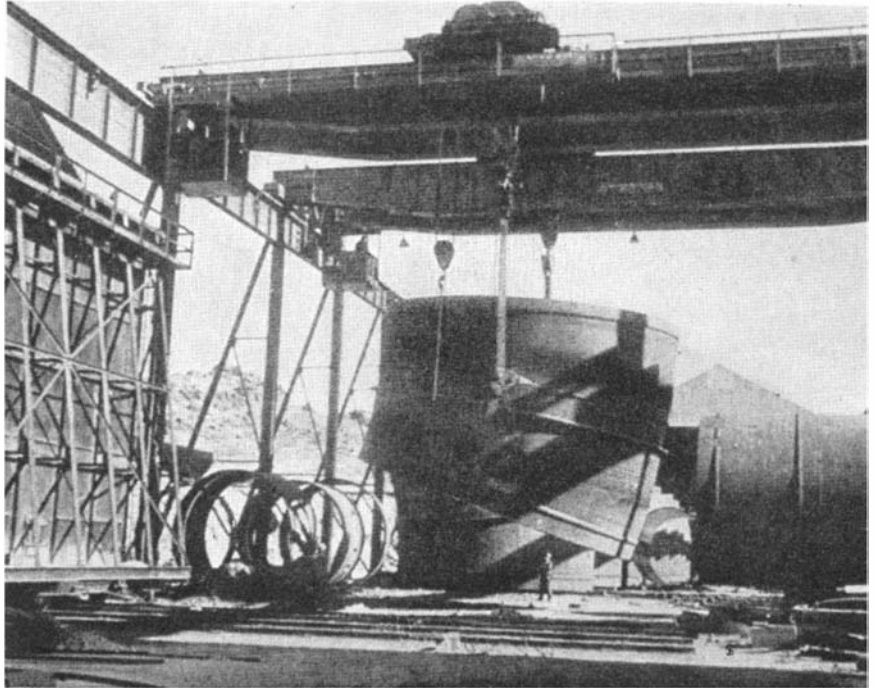
Notwithstanding the precision and uniform operation of the welding machine, each inch of every weld is explored with the aid of extremely powerful X-ray apparatus, and the resulting radiographs are examined by experts to detect any possible deep-seated imperfections. The faulty area of a weld, thus disclosed, is promptly cut out, the weld

reformed, and then X rayed to make sure of its soundness. Before the job is completed no less than 400,000 feet of X-ray films will be used!

After each pipe section is completed in the shop, it is transferred to a furnace where it is held at a stress-relieving temperature that varies with the thickness of the pipe walls, and then allowed to cool gradually. This dissipates any stresses that may have been

axis at right angles to the lower or main truck. When this duplex vehicle reaches the intersecting main tunnel, the upper truck, with the pipe section, is pulled off the lower truck and on to tracks in the main tunnel and drawn thence to the required position for joining the pipe length with the lengths that have preceded it.

The various sections are united by special heavy rivets. In the final as-



The man under the large section gives an idea of sizes

set up in the section during welding. Test pieces are examined after the stress-relieving treatment to make sure that the conduit section meets the specifications in every particular.

The sections are moved by a large trailer from the fabricating plant to the rim of Black Canyon. The trailer is about 37 feet long and 22 feet wide, and is supported on eight axles on which are 16 wheels fitted with solid rubber tires. Upon reaching the rim of the canyon, the sections are picked up and transported to one or the other side of the canyon by the permanent cableway that spans the gorge and is strong enough to handle unit loads of 150 tons. The cableway lowers each section to one of four landing ledges hundreds of feet below. There are two landing ledges on each side of the canyon, and each ledge is at the portal of a construction tunnel driven at right angles into the canyon wall to meet one of the main tunnels, also at right angles, in which conduits are to be placed.

To transfer the pipe sections from a landing ledge, there are double-deck trucks, each mounted on its own wheels, and the upper truck set sidewise on the lower truck. The upper truck bears the pipe section, which has its longitudinal

sembling of the conduits the work will be completed by riveting unriveted joints spaced at intervals of several hundred feet, and this work will be done when the temperature in the tunnel is lower than the lowest average temperature of the water that will flow through the conduits. Should this work have to be done during the hot months, the tunnels will be chilled by mechanical refrigeration. Thereafter, the conduits will have a tendency to expand and not to contract by reason of the temperature of the water within them, and this expansion will automatically increase the compression at the pipe joints and make them that much more watertight.

The contractor is allowed five and a half years in which to finish the fabricating of all the pipe and to install those conduits. When completed, these headers and penstocks will be without a comparable parallel in modern engineering.

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An article in our September issue described the aqueduct for supplying Colorado River water to Los Angeles; another article, to be published soon, will discuss other engineering details of this project.—The Editor.

AMERICA MUST BE SELF-CONTAINED

By JAMES W. GERARD

THE schoolroom and the balance sheet—these are the two most vital factors in America's choice of an economic policy. We must watch lest the red ink on our balance sheet grow into a tide that will swamp the happiness and welfare of future citizens now in the classroom. We must devise an economic policy which will assure these future citizens in the classroom the rights that have been the heritage of all American citizens—life, liberty, and the pursuit of happiness.

But how shall we do this? Only by choosing an economic policy in accordance with present day facts. Such a policy the Committee for America Self-Contained is advocating in urging a policy of economic self-containment.

The whaling industry is dead. And international trade, as we have always understood it, is dying the same stubborn, lingering death. Markets are vanishing. Ports are closing to trade. No longer are the products of international trade indispensable. They are being made at home, or they are being displaced by some other natural or synthetic product. Nations are throwing up tariff barriers and fortifying themselves with quota systems. They are applying science and are living more and more on their own resources and products.

FOR example, Mexican manufactures and tariffs have cut down the American market there for shoes. Flashlight batteries and cigarettes are produced in Yunnan Province in South China more cheaply than the imported products. The saltpetrer industry in Chile is being crippled by the preparation of synthetic nitrates in the United States and other major countries.

Yet, this is but one reason why we must be self-contained. Out of the growth of science has come another development which makes it necessary to revise our old ideas of world trade. Everyone agrees that, as a manufacturing nation, the United States is a leader. But a great danger is inherent in this very strength.

Modern methods of mass production,

AT this crucial stage of recovery from years of depression, when every proposal for bringing back prosperous times is being assiduously studied and some are being experimented with, it ill behooves us to cast aside any possibility without a hearing. The future is still too uncertain for us to be sure that any one plan will operate to solve all our problems or will fail entirely.

For years *Scientific American* has concerned itself with the problem of economic nationalism in articles and editorials. Having nothing to do, *per se*, with international politics—though it has been called a war-breeder—this problem revolves around farm and labor profits, agriculture and industry. It is vital to the nation's welfare and as such has held the attention of scientist and layman, of economist and politician.

In the accompanying article, which we asked Mr. Gerard to write, there are presented some of the reasons advanced by proponents of "controlled economic nationalism" to explain their stand. You may or may not agree with them. We shall remain editorially neutral, and will, therefore, present the other side in a near future issue in an article by Raymond B. Fosdick, noted New York lawyer, who is well known for the many important public posts he has held.—*The Editor.*

which have been largely originated and developed in this country, have been evolved always with a view to operating without highly skilled labor or an undue amount of individual planning and preparation. Standardization, interchangeability, and repetition have become watchwords of American mass production. Speed has also been an objective of primary importance. So skillfully have these ideas been built into

American machinery that even such a delicate affair as the radio tube can be made in large quantities by women with only the most rudimentary training and experience.

Putting such machinery into the hands of workers of other nations, as we have done extensively since the World War, without giving American workmen proper protection, spells competition that can be met only by a slashing of wages and a breaking down of the high standard of living which obtains in the United States and only in the United States.

This is a real danger which surrounds us. It is one with which we must cope.

SINCE the War, we have lent enormous sums abroad, presumably to finance exports. We made these loans without the slightest regard for the laws of good business—we ignored or forgot the fact that there are only three ways of repaying these debts: in gold, which most of our debtors do not have; in credit, which, in the long run, leads only to more credit or to entanglements; or in goods, which would throw thousands of Americans out of work. Thus, upon an already staggering total of war loans, we have piled another mass of debts.

These and similar mistakes are what the Committee for America Self-Contained wants America to avoid. America, the Committee believes, has learned—or should have learned—its lesson in foreign trade. We should formulate a national policy in the light of experience. If this is to be done, what is our first step?

In considering our exports, we must consider the amount of imports we can permit with safety to our industries and labor. The Committee for America Self-Contained does not propose that imports and exports should be completely eliminated. Neither does it propose to cause ourselves inconveniences by striving too rapidly for self-containment. It does propose that we import only commodities which at present we cannot, or that it does not pay us to, manufacture or grow, or that our chemistry cannot produce.

It is proposed to buy from nations who buy from us and in that connection, that our dealings with every nation be perfectly balanced on a bookkeeping basis, passing through and controlled by some central agency.

Only in such a way can we be the masters of our economic life. It is absolutely essential that we keep a ledger in which all outgoing and incoming transactions are strictly balanced. Once we have done this, we can turn resolutely to solving some of our internal problems.

Our foreign trade must be put on a sound bookkeeping basis—a fair return for a fair product. The Committee, therefore, concurs in the action of Congress in granting authority to the President to deal with other nations and to effect an exchange of commodities by means of changes in the tariff. For with the high tariffs and embargoes imposed by other countries today, the situation is such that only through reciprocity can we sensibly extend our foreign trade.

OUR present troubles are due largely to the fact that the buying power of agriculture is below that of industry. In recent years, the incomes of 8,500,000 agriculturists have not kept their ratio with those of industrial workers. For example, in 1927 the farmer made 1387 dollars to the salaried worker's 2084 dollars and the wage worker's 1205 dollars. In 1930, the bottom dropped out of the market; wheat dropped 50 percent; cotton, over 65 percent. In 1932, the farmer made approximately 600 dollars—just barely enough to buy the necessities of life. And what happened? Simply this: 8,500,000 farmers bought far less of industrial products, and, consequently, millions of factory and other workers lost their jobs. And one reason why farm prices have been down is because they have been world prices.

The Committee for America Self-Contained believes the farmer to be a key man in the situation today. If he is helped, buying power of the nation is restored. A simple plan of helping him is suggested by Samuel Crowther in his book, "America Self-Contained:"

"Make the import of all agricultural commodities (wheat, cotton, etc.) that come into competition with our own products discretionary with the Secretary of Agriculture, the discretion being given so that, in the case of a crop failure, the consuming public will not suffer. The Secretary would, for each commodity, then set a domestic quota. For instance, if the records showed that 80 percent of a crop were consumed at home and 20 percent exported, the Secretary would set that quota before the planting season. Then he would fix a minimum price for domestic sales of

that commodity—this price being roughly the world price plus the tariff. The export surplus would go out at world prices and would not be of great consequence, for, if the American farmer could get the benefit of the tariff for his domestic sales, he would not have to bother about the price the surplus brought. It would be velvet."

Admittedly, for the time being at least, the farmer of this country must be permitted to sell his surplus elsewhere. The America Self-Contained movement does not aim to stop such legitimate outlets as are at present



James W. Gerard, Ambassador to Germany during Empire days

necessary for cotton, tobacco, and other farm products, but will do everything within its power to make them more profitable. But primarily, American self-containment will aim to assure the farmer a firm, well-paying market for the bulk of his produce.

But there is little point in striving to evolve a program to aid the farmer, if we are to evade the main issue. No domestic plan to improve the farmer's lot will be of lasting benefit until American farm products are freed from world price fluctuations. This can only be done through a clear-cut policy of self-containment.

We are not in the toddling stage of industrial development as are some of our South American neighbors, for example, who must ship raw products and depend largely on others for their manufactured goods. We have raw materials, the brains, initiative, and organizing ability needed to make us economically independent. We have the wealthiest and most powerful economic machine in the world at our command.

Due to the tremendous advances we have made since the war by the use of science, we are no longer dependent upon Germany for our dyestuffs and our medicaments. Nitrates from Chile are being replaced by our synthetic product, which promises to free our fer-

tilizer and explosives industries from dependence on the outside world. Coffee, tea, silk, tin, raw rubber, and a few minerals continue to be about our only important necessary imports. And we are making inroads even here. In America has come the invention of a synthetic rubber, [So-called. There are two: Duprene and Thiokol.—*Ed.*] superior in many ways to the natural gum. This synthetic rubber is still in the process of being perfected, but it promises one day to be profitably adapted to common rubber goods on a mass production basis. Science has freed, or is freeing, us from every important demand on the outside world.

We are right now our best customers. We are not poor. Half of the world's business is conducted within our borders. We have a much higher income per capita—more buying power right here within our borders—than our most fortunate, most successful neighbors. It should be remembered that our export trade, even in prosperous times, is negligible—rarely exceeding 8 percent of our national production. The average income per capita for the whole world, including the United States, was 153 dollars in 1929. For the United States, it was 657 dollars. In 1930, the average retail sales per capita in the United States were 407 dollars, which is larger than the average net income of any people except the Canadians.

THE possibilities of the American market so exceed the possibilities of foreign markets that the adoption of any policy except that of self-containment seems to be flying in the face of common sense and good business.

America self-contained means a higher standard of living for all of us. It means the American market preserved for the American workman. And it means the return of that security which we sacrificed when we began to place so heavy a dependence on the profits of foreign trade.

Once we have restored a balance between agriculture and industry, once our foreign trade is on a sound bookkeeping basis, once our labor is protected against cheap foreign labor, we could achieve economic self-sufficiency and plentifully distribute our great wealth among ourselves. Farm and factory could exchange one another's maximum production.

This goal, American self-containment, is attainable. It is squarely up to us to go toward it through organized planning.

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C The Committee for America Self-Contained has headquarters at 57 William Street, New York, N. Y., from which it is sending literature on American self-containment, free upon request.

Increased Use of Water-Going Aircraft May Presage a New Era in Aerial Transportation

THAT there is a bright future in this country for the development of water-going aircraft is a conviction which I have long held in common with others who have been following the course of aviation. It is of course a truism that between a large majority of the key cities of the United States more and better landing fields are provided by natural bodies of water than by either man-made or natural airports on land. Oddly enough, little advantage has been taken thus far of this condition. An explanation for this failure to grasp what seems a rather obvious opportunity lies perhaps both in the hitherto somewhat lagging development of water-going craft themselves and in the failure to provide facilities on the natural waters for their most advantageous use.

It is decidedly heartening, therefore, to find that the city of New York, aroused to the opportunities which lie in the rivers embracing the island of Manhattan, should at last be doing something about them. The recent news that practical seaplane ramps were to be provided at two strategic points on the East River was emphatically good news. By permission of the War Department these ramps are to be moored, one at the foot of Wall Street and the other at the pier head at East 31st Street. So located, they offer encouragement at once to the private flier, the specialized airline operator whose activities are confined to comparatively short hops and commuting services, and the operator of scheduled air transport over longer distances.

The outgrowth of plans advocated by George B. Post and Earl D. Osborn—whose Edo Aircraft Corporation has built the pontoons for such well-known

sea-going planes as Colonel Charles A. Lindbergh's Orion, which last year made the 30,000 mile survey for Pan American Airways and now hangs in the Hall of Ocean Life in the American Museum of Natural History, and Admiral Richard E. Byrd's special Condor, now in Little America—the ramps are on a generous scale. The plans, drawn by the United Drydocks, Inc., and presented to the city, call for structures 45 by 85 feet in the clear, and weighing 168 tons each.

These plans have been worked out through a co-operative effort on the part of Mayor LaGuardia, his Commissioner of Aviation, F. William Zelcer, and C. Keith Pevear, construction engineer, through the use of Emergency Relief Funds.

THE ramps, secured to the dock structures at the landward end by eye bolts in such a way as to permit them to rise and fall with the tide, slope into and under water. A draft of five feet is provided at the off-shore end, so that even large amphibians coming in with the wheels down will be able to taxi onto the lower end of the ramp without fear of fouling their landing gear. This level is maintained by an ingenious arrangement of the outboard flotation tank, the water level in which is automatically maintained through the use of compressed air and a ball valve.

Midway of the ramp there is a turntable operated by means of a cable and drum arrangement powered by an electric motor. This motor, bilge pumps, and other pieces of apparatus are housed within a second tank, a duplicate of the outboard one in dimensions, which is, in effect, a floating machine shop, and is placed immediately under the land end

WINGS ON

By REGINALD

of the inclined ramp.

In operation, the seaplane or amphibian has only to propel itself on to the lower edge of the turntable which is then revolved, bringing the craft up out of water, and enabling the passengers to alight on the dock dryshod and in comfort. On the shore end, refreshment and rest rooms and an awning covered observation deck are provided, while ample parking space for 20 or more seaplanes is available at the Wall Street ramp alongside a boom, and, at the uptown terminal, on the pier itself. Considering their usefulness, such ramps represent a very small investment. The cost of the two for the East River has been set at about 35,000 dollars each.

Immediate response to the provision of these facilities came in the New York area through the establishment of commuting service by Suburban Airlines, Incorporated. This organization, of



An artist's conception of for seaplane terminals in



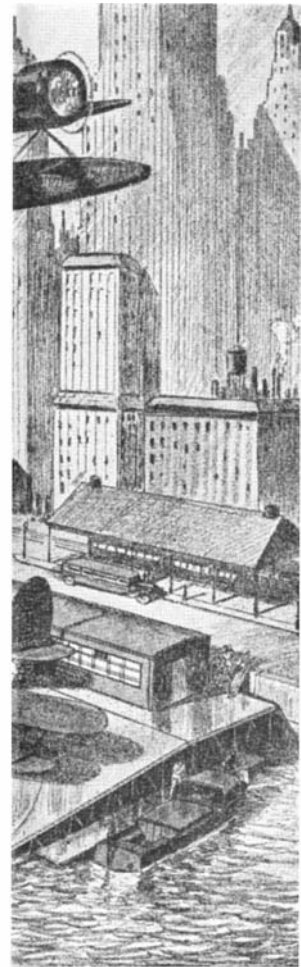
Photograph by Margaret Bourke-White

Brazilian Clipper, which recently set 10 world's records for seaplanes

which E. O. McDonnell, Richard F. Hoyt, Frank Russell, and other men active both in aviation and financial affairs, are interested, responded by putting on first a commuting service with two trips in each direction daily between Oyster Bay and New York, with intermediate stops at Glen Cove and Port Washington, and a mid-day service for shoppers. The running time is 20 minutes as against more than an hour by train. Before this operation was well under way, plans were formulated

OVER WATER

M. CLEVELAND



One of the turntable ramps in the East River, New York

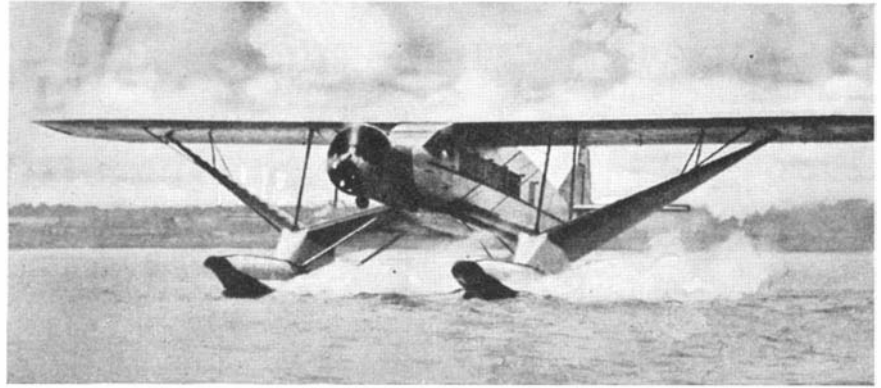
for week-end trips to Martha's Vineyard and Nantucket. Extensions of service to Boston, Philadelphia and Washington, or to more distant Long Island points seem well within the possibilities.

The establishment of ramps of similar type at other cities would make possible airline operation directly to the heart of those cities without the inexcusable waste of time now required to get from airport to business or residential centers. The importance of this lag is, of course, in inverse ratio to the length of the trip by air.

If anything is ever to be done in a practical way with New York City's municipal airport, Floyd Bennett Field, it would seem that it must be done through some such medium as seaplane ramps making possible a ferry service. This 4,000,000-dollar airport development, one of the best fields in the East, is well nigh use-

less because of its inaccessible location with present means of transit. Among the other excellent factors of Floyd Bennett as an airport, however, is a well-protected seaplane ramp, though not of the ultra-modern kind provided in the East River. It would therefore be entirely possible for transport airlines to land passengers at the municipal port could they be persuaded so to do, transship them to seaplanes, and have them in the financial or shopping district 15 to 20 minutes after landing.

There can be no doubt that the municipal authorities have this development in mind in encouraging the ramp project, for Floyd Bennett is a white elephant not a little expensive to feed, and particularly irritating therefore, to a Mayor who is himself a flier and strongly aviation-minded.



One of the new Bellanca Aircruiser seaplanes flown by Suburban Airlines, Inc., in a commuting service to New York City, using the new ramps described

It is not only in the interesting ramp development, however, that water-going aircraft have received stimulus and encouragement of late. The first of the three S-42 Sikorsky flying boats for Pan-American, in its flight tests, has substantially exceeded the stiff requirements laid down by the airline's engineers working with Colonel Lindbergh, chairman of its technical committee.

This graceful, commodious ship, called *Brazilian Clipper*, which will take

SINCE the writing of the accompanying article, the Sikorsky flying boat, *Brazilian Clipper*, has established eight world's records, aside from the two mentioned. All of the records that were broken had recently been established abroad. The new ones were set up during a flight of the ship over 1244 miles at an average cruising speed of 157.5 miles an hour, using 69 percent of the 3000 horsepower available. The flight was witnessed by an official observer of the National Aeronautic Association and the F.A.I., assisted by 17 other men stationed at checking points along the 311-mile course.—*The Editor*

two days off the flying time between Miami and Buenos Aires, shows truly remarkable flying qualities. She has made two world's records, the first for carrying a payload of eight tons to an altitude of 15,084 feet, the second for carrying a payload of 5½ tons to an altitude of 21,800 feet.

On a gusty day in July with Colonel Lindbergh at the controls and a total of 31 persons aboard, she readily made 190 miles an hour at 6500 feet, yet landed at not more than 60 miles an hour. Both take-off and landing were really remarkable. At the take-off, the 3000 horsepower of the four Hornet engines was of course utilized at its best by means of controllable pitch propellers, but here too Igor Sikorsky's

adaptation of the flap came into play. In this monoplane, the flap is not a split flap in which part of the trailing edge is lowered, leaving the upper segment in place. Instead, the after portion of the entire wing from aileron to aileron is deflected downward, thus changing the camber of the wing and giving marked increase in lift without parallel increase in drag.

On the day in question, with Edwin C. Musick, chief pilot of the air line, at the controls, the great plane fairly leaped into the air after a take-off run of 15 seconds. In half a minute it was 500 feet above the water.

QUITE as remarkable, at least to this observer, as its agility is the steadiness of the *Brazilian Clipper* on the water and in flight. There was a 2½-foot sea running when I rode in her, enough to prove that she was a comfortable sea boat. The air was rough and bumpy, so that pilots coming into the Bridgeport field had all remarked the gusty conditions aloft. Yet the *Brazilian Clipper*, either coasting along at 100 miles an hour with flaps partly down to enable photographic planes to keep abreast, or opened out and doing 190, was as steady as a rock. One would not have imagined there was a bump within leagues.

This to me was a satisfactory demonstration of the soundness of a most interesting study which Mr. Sikorsky had told me of some months before. The study in question was that of the wing loading of birds. He had found, he said, that while a large land bird, like the condor of the Andes, which alights relatively frequently, has a wing loading of a pound and a half a square foot, and a wing relatively broad or of low aspect ratio, the soaring birds, like the albatross, that keeps awing for days on end through storm and calm, have a heavy wing loading, three pounds per square foot for the albatross, and a high aspect ratio.

Following this object lesson of nature, the S-42's have a narrow wing and a wing loading of 28 pounds per square foot. They cleave the gusts unmoved.

SOME TRICKS OF THE TRADE

By JOHN F. BRANDT
Bausch & Lomb Optical Company

WE cannot study the microscopic very long without acquiring a very firm belief in the importance of small things. The same is equally true in everything else. We would not look forward with equanimity to being operated on by a surgeon who had never held a scalpel in his hand but who had read books on surgery by the hundreds. Why? Mainly because we could not be sure that he had learned those tricks of the trade which would allow his patient to go around saying, "Have you heard about my operation?" instead of asking, "Have you a size 7½ halo?"

In general, these little tricks of the trade are quite overlooked by the books on any subject. The author himself either uses them so naturally that he has quite forgotten that they are not a part of the equipment of the beginner in his subject, or else he was forced to leave them out because of the necessity of cramming a life-time study between the two covers of a single book. Once in a while, however, writers forget the rules, or memories of their own early days come suddenly to start their hands awriting. Let us see what we can find among these most fortunate lapses—"tricks of our trade in microscopy."



Points on glass tubing drawn out into thin air

KEEP BOTH EYES OPEN: There is nothing new about this rule of using the microscope. But how many of us have tried it and at last have taken instead to holding our hand over the other eye, or at least to squinting? You will find it a great help if you place the microscope on a sheet of dull black card, such as that which is used for making signs and price tags in department stores. Its use is a case of simply following the principle of not having any bright light reflected into the "other" eye, which you are trying to forget. If you slant your head slightly, so that the eye you are not using looks away from the microscope, instead of along the body tube, you will find it a help. An eye shield, with notch for the nose, may be placed at the eye piece.

FINE FOCUSING: You can make a satisfactory adjustment of the focus on microscopes which have a draw tube

but no fine adjustment, by focusing as carefully as possible with the coarse focusing adjustment and then moving the draw tube up and down very slightly with a twisting motion.

ILLUMINATION: Many professional microscopists use a piece of flashed opal or ground glass directly in front of the mirror, even though the light source has its own ground glass window. You need only to have a piece of glass large enough so that the top edge can be leaned against the front edge of the stage on the microscope.

Filters are excellent things to use for both visual and photomicrographic work. As soon as you become accustomed to them you will find that they have greatly increased the resolution of the microscope and are easier on the eyes. The green filter used in photographic work is recommended. This can be bought of any photo supply dealer. If you would like to experiment with different color filters, without going to too great an expense, you can make some yourself. Fix an ordinary photographic glass negative without first exposing it to the light. The gelatin that remains on the plate may now be tinted with various colored dyes as you wish. Simply dip the plate in a bath of dye, or paint it with a soft brush.

A SIMPLE LIFE CELL: One of the difficulties of studying or photographing living protozoa and infusoria is that they insist on swimming hastily out of the field of view. After a while you begin to think that they certainly must be very self-conscious creatures who resent this intimate inspection of their daily life. There are several methods of slowing them down (dissolving a tiny menthol crystal in the water, or thickening the medium with gelatin) but you can also make a cell just the size of the field of view. Mould some paraffin by melting it and pouring it into a tube made of ordinary writing paper, slightly larger than the size of the cover glasses you are using. When the wax is hard, drill

a small hole in the center, the size of the field of view at whatever powers you wish to use. This, naturally, requires a trial and error method and examination under the microscope. When you have the right sized hole pierced in the paraffin, slice off a very thin section of it, either in a microtome or with a wet razor blade. Again use the trial and error method to determine when the sections are of just the right thickness to prevent the organisms from swimming out of focus. Rub a little Vaseline on both the top and bottom of the section, place it in the middle of the slide, drop the organism into the hole in the center and cover with a cover glass. Mr. Infusoria is now forced to remain in the spotlight!



A wash bottle for the microscopist's use

THE WELL KNOWN AMOEBA: If you have had difficulty in finding that very interesting bit of protoplasm, the amoeba, here is a method of capturing which usually gets results. Gather a handful of dried leaves that have fallen from any tree, and boil them in water until you have a nice thick soup. Pour the whole thing into a quart jar and allow it to cool to room temperature. Now put in a few more dried, but uncooked, leaves and wait for a scum to form on the surface of the water. In this scum you will find, in all probability, a large number of amoebas, though they will be somewhat smaller than those usually found on the leaves and stems of pond plants.



An eye shield for the microscope

TURN THEM OVER! The micro-manipulator is a device for dissecting, injecting and generally annoying microscopic specimens. The tools used on the micro-manipulator are simply small glass tubes drawn out to a fine point. The author has known professional microscopists to get very good results simply by using these tools in their own

hands. If you feel like experimenting, purchase some capillary tubing from a laboratory supply house. Heat this over an alcohol lamp or a micro burner, as the Bunsen burner or the flame of a gas stove is so hot that it makes somewhat difficult handling. When the tubing is sufficiently soft at the heated point, draw it out so that it has about one half of its original thickness and allow it to cool. Again heat it in the center of the thinner portion thus produced and, when soft, draw it out sharply until it pulls apart, leaving a very sharp point. The result is a small glass "poker," whose handle is the original size of the capillary tube, its end narrowed down to about one half that thickness, and then abruptly fading off into thin air. It takes some practice to make these properly, and you will often break them, but they will offer no end of possibilities. The point can be bent, straight or curved, as you wish.

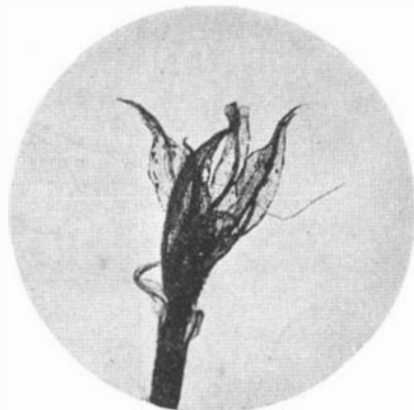
THE WASH BOTTLE: You are probably familiar with the wash bottle used in a chemical laboratory. In microscopic work we must use very small quantities of liquids on occasion and this wash bottle is a very convenient form. We can easily make one or several for our own laboratory. The necessities are a bottle of whatever size you wish, a two-holed rubber stopper to fit this bottle, a short length of glass tubing and an ordinary medicine dropper.

The glass tubing is heated over a gas flame or Bunsen burner, and drawn out and broken off so that it has a very small opening. It is again heated in about the center and bent over to something less than a 90-degree angle. The unpointed end of the tube is now inserted far enough into the rubber stopper so that, when the stopper is inserted in the bottle, the tubing comes just a little above the bottom. The medicine dropper is inserted in the other hole in the stopper, but not far enough down so that its point will touch the reagent or dye kept in the bottle. When the bulb of the medicine dropper is pressed the atmospheric pressure drives the liquid up and through the tube so that it can be deposited on the slide in whatever quantity is desired. When the bulb is released the liquid in the tube is pulled back into the bottle, accompanied by some air which makes up in volume for the amount of liquid used. Since the tube is bent over, no dust can get into the liquid. An empty bottle of this type may also be used for sucking out excess liquid, as in a live cell.

EMBRYOLOGY: If you are interested in embryology it is not absolutely necessary that you go in for chick embryos and the like. Fish eggs can be studied from the moment of laying up until the young finally absorb the yolk sacks,

without any difficulty and at almost no expense. The small tropical fish, which can be purchased at any pet shop or aquarium store, are the best for the home aquarium and are extremely interesting in themselves. The necessities are a five-gallon aquarium, some sand, plenty of plants to oxygenate the water, and a heater and thermostat to keep the water at about 76 degrees.

Place the tank in a north window where it will receive plenty of light, but not sunlight. Medakas are beautiful little fish, and a pair of these is quite inexpensive and easy for the beginner to breed. Their eggs will be found to resemble tiny bunches of grapes hanging on the seaweed.



A MICRO-PROJECTOR: For your own amusement and that of your friends, a micro-projector should be a part of your equipment. The only essentials, aside from your microscope, are a powerful illuminating source and some form of screen. A 100-watt bulb will serve as an illuminant. A 52-candle power automobile headlight bulb, also, is excellent because of its concentrated filament. Mount the bulb in any convenient manner to direct the light to your microscope mirror, or into the condenser if the microscope can be inclined. If possible, form an image of the light source on the specimen with a condenser. A number of different materials can be used for screens. A large sheet of smooth white paper, thumbtacked to the wall, makes a very good projection surface. These can be purchased from a printer. Draughtsmen's tracing cloth stretched tight in a two-foot square frame of wood forms a "translucent" screen. That is, the screen is between the micro-projector and the audience, which sees the image as if on the ground glass of a camera. Plan to project at the lowest powers of your microscope at distances from two to four feet, unless you have an extremely powerful light source.

EDITOR'S NOTE: We have received for review a copy of a newly published book entitled "Adventures with the Micro-

scope," by Julian D. Corrington, Ph.D., microscopist of the Frank A. Ward Foundation of Natural Science at the University of Rochester, and have read this volume with keen interest. It covers just about everything under the shining sun which could be regarded as possible work or fun for the amateur microscopist: the microscope and its operation; microscope accessories; col-

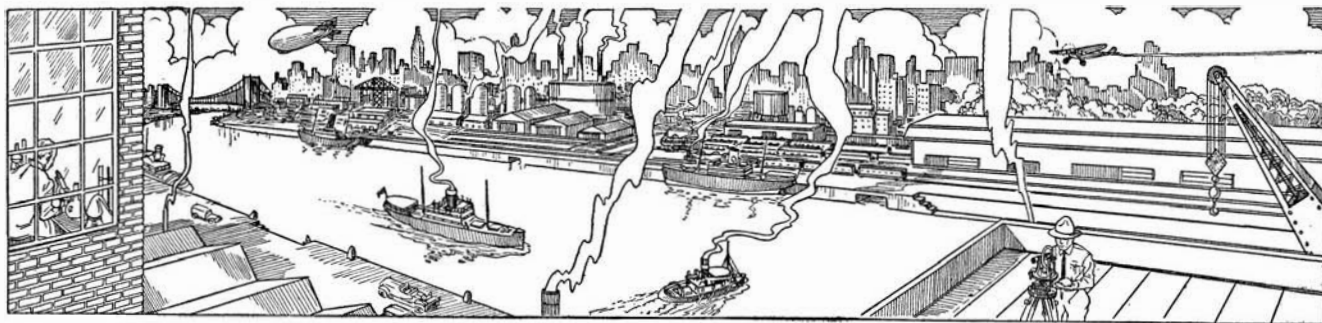


Bright and dark field illumination contrasted—dark above and bright at left. In the dark field illumination the light strikes the object from the sides, and none comes into the eye directly; what does reach the eye comes from the object. It very often reveals added details

lecting microcosmic materials (protozoa, algae, and so on); soil microscopy; mineral microscopy; insect microscopy and technique; hair and fur microscopy; photomicrography; drawing with the microscope; plant studies (sections); bacteria studies; tissue study; microscopy of body parasites, and other things. No such book has ever been made available to the English-speaking amateur, and this is the book we have long wished someone would write, for there has been no all-around hobby book for the amateur microscopist and we have been forced to recommend makeshifts. Its viewpoint is strictly amateur and it is practical. It has 455 pages and 365 illustrations, and is a large book.

In a whimsical chapter at the end we learn from Dr. Watson that Sherlock Holmes has found a suitable occupation for his later years, having established the "Sherlock Holmes School of Criminology," in Baker Street, his old haunt. Microscopes appear to be the sun around which the school revolves—microscopes for comparing earth samples, bullet comparison microscopes, hair and fiber, finger-print microscopes, and so on.

We do not sell this book, although it can be purchased. It is sponsored by the Bausch and Lomb Optical Company of Rochester, New York, and its sale is mainly linked with the sale of a microscope. In spite of this we can sincerely recommend it as an excellent work.



THE SCIENTIFIC AMERICAN DIGEST

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Lehigh University

Bathysphere Has New Quartz Windows

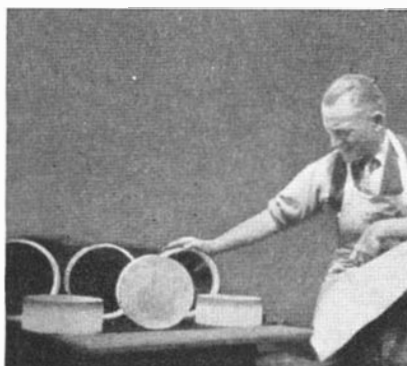
EARLY in August Dr. William Beebe and his associate, Otis Barton, broke all deep-sea diving records in their bathysphere by descending 3028 feet beneath the ocean surface off Bermuda. This famous spherical diving chamber is equipped this year with windows of fused quartz, the blanks for which were furnished by the General Electric Company and were accurately ground and polished by the A. D. Jones Optical Works.

These clear fused quartz windows provided perfect protection during the record dive and no doubt will prove as satisfactory at still greater depths to which Dr. Beebe and Mr. Barton expect to descend shortly. Fused quartz has a crushing strength somewhere between six and sixteen times that of glass, while its low coefficient of expansion permits the windows to be subjected to severe changes of temperature without danger of cracking; yet the transparency is higher than that of glass.

The three fused quartz windows used in the bathysphere—eight inches in diameter and three inches thick—are made from the highest quality of rock crystal fused in a vacuum and then subjected to high gas pressure while in the molten state. If such a large mass of crystal as is necessary to make each of these windows were fused in air it would be opaque due to innumerable gas bubbles, but by fusing in a vacuum,

the number and size of bubbles is greatly reduced, and many of those remaining may contain gas at a very low pressure or are evacuated spaces caused by the condensation of silica vapor which formed them at the high temperature of 1800 degrees, Centigrade, necessary to cause fusing.

In spite of the manufacturing difficulties, the round quartz blanks used for the bathy-



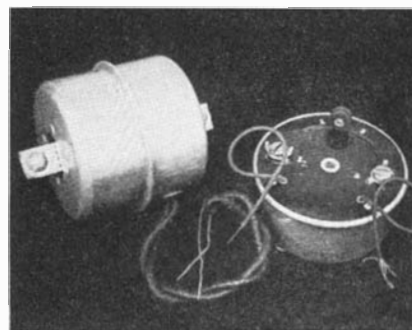
Fused quartz bathysphere windows

sphere windows cost as little as 160 dollars each, in the rough.

In the Bermuda seas, many millions of strange creatures that inhabit the blackest of the ocean half a mile deep will be studied by Dr. Beebe, who now will be able to photograph all stages of sea life—protected by accurately ground and polished fused quartz windows of maximum strength and transparency.

Noiseless All-Wave Radio Antenna System

ASINGLE antenna with automatic frequency selector and impedance matching switch whereby either an ideal broadcast or ideal short-wave antenna circuit is provided for intercepted signals, with a positive minimum of background noise, is announced by the Technical Appliance Corporation of Long Island City. Known as the H-F (High-Fidelity) All-Wave An-



Antenna and receiver units for the new noiseless radio antenna system

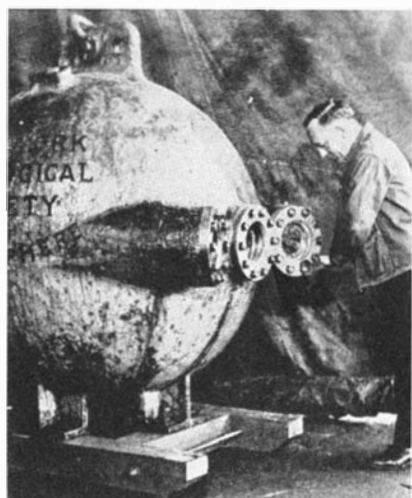
tenna System, the arrangement is available in complete kit form including wire and insulators, or as individual antenna and receiver units.

This noiseless all-wave antenna system is intended primarily for all-wave receivers. It provides the efficiency heretofore attained only through the use of separate broadcast and short-wave aerials, with the added feature of minimum background noise.

Two units comprise the heart of the system. The antenna unit, a compact aluminum-encased device with screw binding posts to hold the ends of the aerial wire, is inserted at or near the center of a single-wire aerial. The unit automatically routes signals through the most desirable combination of aerial and downlead. The companion set unit, mounted near the receiver, is provided with a switch for impedance selection whereby to obtain the most effective coupling between receiver and downlead. A twisted-pair cable for the downlead cancels out inductive interference or background noise, including the usual troublesome automotive ignition interference. The new system is licensed under the A. A. K. antenna system patents.

Chemicals Repulse Ravages of "Red Tide"

TURNING back the "red tide," which periodically sweeps in from the sea to wreak havoc with the pearl-oyster beds along the coast of Japan, is one of the most recent and romantic applications of modern chemistry. Large areas of the sea along Ise Bay are used for the cultivation of pearl-oysters and the jewels produced by the crustaceans are the basis of a large and



Tightening clamps that hold the quartz windows in the bathysphere

prosperous Japanese industry. But even the pearl growers have their trials and tribulations, for now and then the "red tide" appears—an onslaught of red micro-organisms, so small that 25,000 of them have plenty of room to circulate in a single cubic centimeter of sea water. But they color the water red—and they cause millions of dollars worth of damage each year to the pearl-oyster beds.

Japanese chemists have found that they can halt the ravages of the "red tide" by diffusing certain chemicals through the oyster bed. A solution of ferric chloride does the trick; so does chlorine gas. Motor boats have been rigged up with apparatus to spread these chemicals through the infested areas by discharging a stream of them from the stern of the boat in such a way that they are churned into the water by the propeller.—A. E. B.

Snakes Not Speed Demons

THE popular idea that snakes move with extreme rapidity was put to test and found wanting in snake speed trials made and reported before a meeting of the American Association for the Advancement of Science by Dr. Walter Mosauer of the University of California at Los Angeles.

A man can walk faster than the fleetest snake, upon which Dr. Mosauer held a stop watch, can glide, for the maximum velocity did not exceed three and one third miles per hour, approximately equivalent to 67 seconds for the hundred-meter dash.

The snake's reputation for speed is based on the deceptive grace of its smooth, fluent undulatory gliding, Dr. Mosauer concluded. The snake's apparent flashing speed is an optical illusion.

Of seven typical North American snakes tested, the red racer was speediest, while the California boa, with a rate of only a quarter-mile per hour, was slowest of all.

Dr. Mosauer admitted that these speed records might be broken by vigorous and excited reptiles during sudden speed bursts and that some tropical snakes may double or treble the American records. But he is confident that a man can easily outrun any snake of the United States and possibly of the world.—*Science Service.*

Bottle Seal Cannot be Counterfeited

SCIENTISTS, setting about to foil the bootlegger, have developed a type of seal for bottles which cannot be counterfeited. The Bureau of Industrial Alcohol of the United States Treasury Department has approved the use of these seals over the government tax stamp, according to the



Bottle seals that cannot be copied

manufacturers of this new protective device.

During prohibition, bootleggers developed imitation into more or less of an art and thereby were enabled to give liquor packages every appearance of being genuine. With the coming of repeal, the practice has been continued.

The principal reason why the new seals cannot be simulated is because the cellulose

WALTER FRANKLIN PRINCE

READERS of *Scientific American*, familiar with the writings of Dr. Walter Franklin Prince, will grieve to hear that Dr. Prince passed away on August 7 at his home in Hingham, Massachusetts, at the age of 71. A graduate of Yale, Dr. Prince has long been associated with psychic research work, at first with the American Society for Psychic Research, and later with the Boston Society. He was also Past President of the Society for Psychical Research, London.

For many years Dr. Prince was a member of the staff of *Scientific American*, co-operating actively in all matters pertaining to psychic phenomena, and contributing numerous articles on allied subjects to these pages. We mourn the passing of our fellow worker, who has left a gap in the ranks that will be difficult to fill.—*The Editor.*

material used in making them can be produced only in a plant involving a heavy investment of capital and requiring an unusual degree of technical knowledge and skill for its operation. Besides, these protective seals can be obtained only by reputable concerns or individuals.

There are two styles of these seals. One is so made that it is sufficiently transparent to permit seeing the government stamp through it, though it appears opaque from a distance and provides a background for the trade mark of the distiller, a facsimile signature or lettering.

The other style is opaque front and back, but has transparent "windows" at the sides which give a clear view of the strip stamp. The opaque portions provide space for a trade mark or other means of identification. The identifying mark is applied by the impregnation of the seal material during the process of manufacturing. This is a secret method and cannot be imitated by bootleggers.

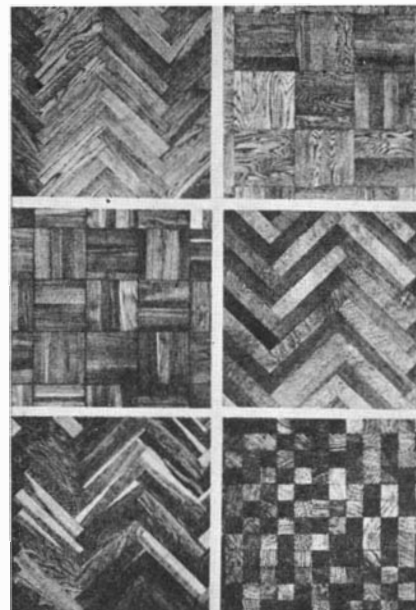
The seal, as it comes from the factory, is in the form of a band or sleeve and is moist. It is applied over the cork or stopper and the neck of the bottle and the government stamp. As the band dries it shrinks tightly around the container.

Floors of Many Woods

FLOORS in 30 rooms of the United States Forest Products Laboratory, Madison, Wisconsin, have been laid with a varied and colorful assortment of American woods to demonstrate and test the merits of dif-

ferent patterns and finishes, as well as to acquaint the general public with the attractions of different species and types of grain. The materials range from straight-grained quarter-sawn western hemlock laid up in conventional lengths to walnut laid in 8-inch built-up squares.

Three main types of flooring are now in place throughout the Forest Products Laboratory as a whole—wood flooring strips



Sections of wood flooring of various types, laid for test purposes

and blocks, pressed wood fiber tile, and linoleum, the last-named qualifying very appropriately among forest products because of its large content of cork, wood flour, and forest-produced resins and oils. All of the floors were laid over concrete of average flatness. Some of the woods used have only recently been considered for flooring purposes, and others were installed to demonstrate unusual effects that can be obtained when extreme durability is not essential.

Overweight Men Healthier and Stronger

OVERWEIGHT young men have more physical endurance, greater resistance to infectious diseases, and are less likely to develop nervous or mental disorders than young men who are underweight.

These conclusions were drawn from a study of accepted entrants to the Royal Air Force and were reported by Dr. H. A. Treadgold, Group Captain, Royal Air Force, to *The Lancet*, medical journal published in London.

Dr. Treadgold compared the men's weights when they entered the Royal Air Force with their accomplishments in athletic competition and records of sick leave and invaliding from the Service.

"There is a definite relationship between varying degrees of body-build and functional efficiency, whether viewed from the points of capacity to endure severe or prolonged physical or mental stress or resistance to disease generally," he found.

"Capacity to endure severe or prolonged physical stress as evidenced by athletic prowess is found most commonly among the over-weights. An exception to this is seen in long-distance athletes among whom

underweight is commoner than overweight.

"The greater the degree of underweight on entry, the greater the likelihood of invaliding from the Service on medical grounds.

"It is uncommon for overweight individuals to become underweight and vice-versa."—*Science Service.*

Scientific American Inspires Development of a Modern Geophysical Instrument

THE October, 1932 issue of the SCIENTIFIC AMERICAN described briefly an instrument for detecting the presence of electrically conductive ore beds and metallic deposits which are buried at moderate depths beneath the surface of the earth. This instrument, which was termed an Ore Detector, was designed and constructed, on special order from mining interests, by the geophysical firm of William M. Barret, Inc. This organization now announces the development of a simpler, more portable, and decidedly more economical instrument, the Terrometer, for accomplishing the same results as their original special-order apparatus, and which is suitable for general distribution. "The development of the Terrometer," says Mr. Barret, "was largely prompted by the evident and genuine interest aroused by our special-order apparatus described in SCIENTIFIC AMERICAN."

The new instrument consists essentially of a high-frequency oscillator and sensitive detector, maintained in rigid alignment by supporting arms, and provided with carrying handles for manual transportation. The Terrometer is equipped with a rugged pointer-type galvanometer for indicating the response due to the presence of differential conductivities.

In operation, the oscillator produces a high-frequency electromagnetic field which not only reacts on the detector but enters the earth and penetrates to a considerable depth. Initially the orientation of the oscillator and detector is such that, with no disturbing mass in the neighborhood of the instrument, a minute exciting current flows in the detector circuits. The magnitude of the detector excitation, which may be controlled by varying the angularity of the os-

illator, is so adjusted that approximately midscale deflection is indicated by the galvanometer connected to the output terminals of the detector. If an electrically conductive mass be now brought within the effective range of the oscillator field, then this mass causes a secondary field which reacts on the detector circuits and thereby produces a change in the galvanometer reading.

The Terrometer is particularly suited to mapping the distribution of buried pipe-



Two easily carried units constitute the geophysical instrument

lines which transport oil, gas, water, and so forth; to mining problems involving the detection of relatively shallow deposits of elements and minerals whose conductivities differ sufficiently from the country rock; to the search for buried treasure; and, in fact, to the multitude of problems that require the location of hidden masses of electrically conductive materials, or materials whose conductivities differ sufficiently from that of the surrounding media.

The manufacture and distribution of the Terrometer will be under the direction of the Engineering Research Corporation, Giddens-Lane Building, Shreveport, Louisiana.

Tin Preserves Grapefruit

WHILE chemists are energetically searching for some substance, such as an enamel, with which to coat the inside of tin cans to prevent attack of metal by contents, along comes the odd discovery that the very action they seek to prevent seems to be beneficial, at least in the case of one popular delicacy—canned grapefruit. A. E. Stevenson, writing in *Industrial and Engineering Chemistry*, reports that experiments have been made with several different enamels but none, so far, has been as satisfactory as plain cans.

Canned grapefruit when stored at ordinary temperatures gradually becomes slightly yellow. When packed in plain cans, the reducing action of tin has a bleaching effect which retards color changes. In the enameled can, the color change, therefore, is more rapid. In addition, grapefruit packed in enameled cans has a slightly different and less agreeable flavor than that in plain cans; this difference in flavor is apparently

connected with changes which are retarded or prevented by direct contact with tin. The change in color of grapefruit in plain cans, together with the toughening which accompanies it, is retarded by low storage temperatures.—A. E. B.

Is "Empty" Space Empty?

THE cluster of stars or galaxy of which the sun and the earth are a part is only one of 100,000,000 similar galaxies which modern telescopes can now see, declares Dr. J. A. Anderson, astronomer of Carnegie Institution's Mount Wilson Observatory.

In our own galaxy there are over 10,000,000,000 stars. So spread apart are they, however, that if each one were represented by a tiny raindrop only one eighth of an inch in diameter, each would have to be separated by a distance of four miles from the next one to present a picture of our galaxy in respect to its star distribution, declares Dr. Anderson.

Thus only a minute fraction of space is occupied by matter. "Is the rest empty?" asks Dr. Anderson. Not necessarily, he says. There is good evidence that in the emptiness of space between the stars of our own galaxy there exists a very tenuous medium consisting of neutral atoms of sodium and ionized atoms of calcium which have lost one electron and become electrified. Some estimates, Dr. Anderson declares, maintain that the total mass of this tenuous matter is about equal to the mass of the 10,000,000,000 stars the galaxy contains.

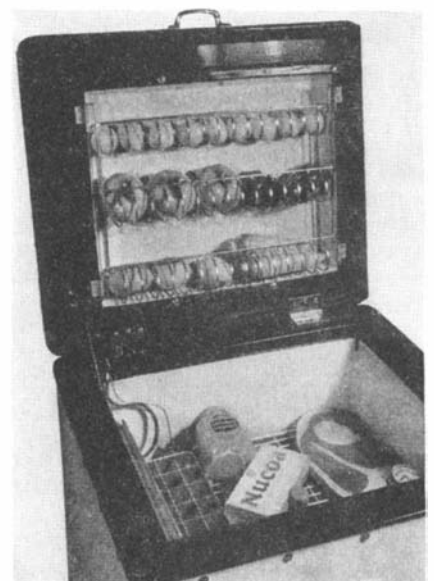
Flying about through space also, he says, is the enormous amount of energy given off by all the stars in the form of radiation. In part the radiation is visible but much of it is invisible.—*Science Service.*

New Type Electric Refrigeration

IN its announcement recently of a radically new type, low-priced electric refrigerator, the Crosley Radio Corporation has taken another important step in its efforts to make electric refrigeration available for practically every family. This latest development is a small, compact, highly efficient electric refrigerator chest—the first of its kind to be offered by the industry.



Showing how the geophysical instrument is carried when in use



A new low cost electric refrigerator in which the flat top is the door

Contrasting with the ordinary electric refrigerator with its door swinging out from the front, the new "Chest Shelvador" opens at the top. It has a capacity of two cubic feet net and 4.2 square feet shelf space. Additional storage space for small articles of food is made available through this unique door. The standard Crosley compressor with a $\frac{1}{8}$ horsepower motor assures both highly efficient refrigeration and low electrical current consumption. The two ice trays have a capacity of at least two pounds of ice.

A Noteworthy Amphibian

ONE of our photographs shows a new Curtiss-Wright amphibian designed by Captain Frank Courtney, in one of its flight tests over Long Island Sound. In these columns we no longer seek to describe even briefly every new airplane that is placed on the market. The comparatively new airplane art has reached a certain stage of convention and similarity, but this new amphibian has many novel features.

The power plant is of distinct originality. A 365 horsepower Whirlwind engine is employed, mounted well forward within the upper wing of the biplane cellule. Yet a "pusher" propeller is used; that is, one mounted in the rear of the wing. This rear mounting of the propeller is possible because the drive is carried aft on a short extension shaft. The arrangement offers a number of advantages. The propeller is clear of the cabin, which greatly facilitates docking. At the same time the engine is provided with a streamline cowling, which leads to greater propeller efficiency and reduction of drag, and its accessories are more readily accessible. The nose of this cowl is in itself the oil tank, so that excellent oil cooling is possible without extra drag.

The next feature of interest is in the landing gear. Flying boats and landplanes of the same size handle just about the same in the air, but they are not piloted in the same way on taking off or landing. Many a skilled Army pilot has found himself in trouble when in charge of a flying boat or seaplane. For an amphibian it is

highly important that the process of take-off or landing should be exactly the same whether on land or on water. In a flying boat the machine alights tail low, first touches the water on the step, which is placed some distance back of the center of gravity, and then gradually falls forward on the nose. In the ordinary land plane the front wheels touch first and then the machine gradually falls down on the tail. There is a distinct and obvious difference in the two processes. In the Curtiss-Wright amphibian however, the main two wheels are placed to the rear, and a single front wheel is placed at the extreme nose of the hull. A little reflection will show that landing on land or alighting on water will therefore call for the same maneuver by the pilot. Still another advantage of this rearward wheel arrangement is that the main wheels can be completely enclosed in the hull without interfering with the cabin arrangements.

Our readers may also note a mast at the nose of the hull. It is into this mast that the nose wheel support retracts. At the same time this mast is extremely useful as a handhold when docking or mooring.

The general design is excellent. With pilot, four passengers, ample gas and fuel, marine gear, and 120 pounds for luxury equipment, the gross weight is 4650 pounds. The top speed is 151 miles per hour, which is excellent for this type and load and power. The span is relatively small—40 feet—making for easy accommodation. With reversible passenger seats, card tables, easy entrance through the front hatch without interference by the slipstream, and so on, we have an air yacht well adapted to the needs of the private owner.—A. K.

A Noise Analyzer for the Airplane

IN studying the sound proofing of airplanes it is important to know not only the noise level in decibels but also the frequency or pitch of the noises. This is because some methods of sound proofing are better suited to one pitch than to another; because some pitches of sound are more

annoying than others; and because it is important to know the source as well as the intensity of the sound.

To meet this situation Westinghouse engineers have developed a sound frequency analyzer which has given excellent service in tests of a General Aviation airliner. The



Analyzing the noise in an airplane

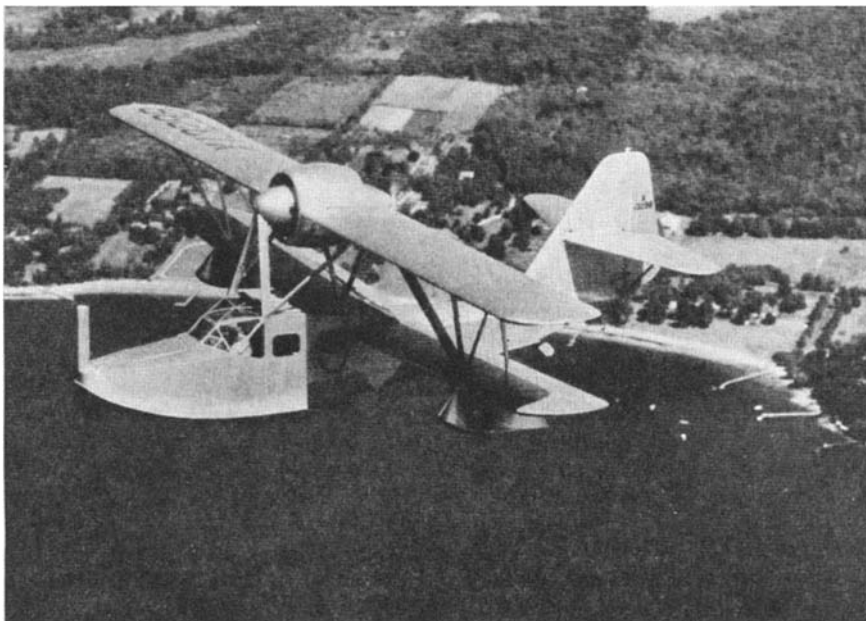
analyzer has indicated not only the general sound level, but also the sound level of different types of noises.

The filter which picks out the varying frequencies consists of a brass rod supported at the center in such a manner that it will respond to longitudinal vibrations. Attached to each end of the rod is a small coil that floats in a steady magnetic field. The detector output is applied to one of these coils, so that when the detector current contains a component of resonant frequency with the sound wave a vigorous longitudinal vibration will be set up in the rod. The voltage generated in the other coil due to this vibrational velocity is then amplified and measured by the output meter.

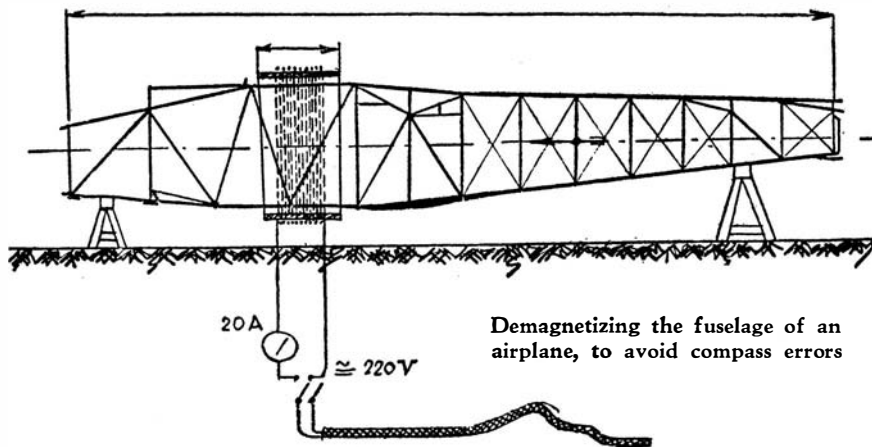
The central support of the rod is in the form of a flexible diaphragm, so that if there is any unbalance between the two halves of the filter, the support will allow the rod to seek its own natural nodal point. Since the natural frequency of the filter is quite high, the diaphragm need not be so flexible as to cause a lack of rigidity in the structure. The effect of extraneous nodes of vibration is eliminated by clamping the diaphragm between layers of soft rubber and by a tuned transformer in the amplifier circuit.—A. K.

De-Magnetizing a Fuselage

IN a flight from Vienna to Budapest, Monsieur Safarik of the French Bureau Veritas in Prague had his plané struck by lightning. As a result, the metal fuselage of his craft became so strongly magnetized that it was found impossible to compensate for the errors of the compass. Without a compass a pilot cannot navigate and it was at first thought necessary to junk the fuselage. Vibrations encountered in subsequent flights had no apparent effect on the magnetization. Annealing the metal was too hazardous; such annealing would have eliminated the magnetization but would have reduced the strength too much.



A Curtiss-Wright amphibian during a trial flight



Finally a practical expedient was arrived at, which is illustrated in the sketch. On a wooden frame large enough to embrace a portion of the fuselage at its maximum diameter, a number of turns of copper wire were wound. The coil thus formed was connected to an alternating current circuit of 220 volts. After the coil had been subjected to this alternating current for an hour it was moved along the fuselage. Under the influence of this electrical "massage," the apparently permanent magnetization disappeared entirely. This process has been repeated successfully a number of times and is a useful thing to remember for aircraft operators.—A. K.

Insulation for Airplanes

VIRTUALLY unanimous acceptance by European airplane manufacturers of Seapak, insulation material manufactured here, is announced by the Seaman Paper Company. According to authentic reports, 16 foreign manufacturers of cabin planes throughout Europe and in England have adopted and are now using Seapak for the sound and temperature insulation of passenger cabins.

Seapak, which consists of kapok in flexible sheet form, is only two years old in this country, and its introduction into foreign fields began less than a year ago. In addition to use in planes, this material has made progress in the foreign automobile and railroad field. It has been adopted for insulation of bodies by the Bianchi and Hispano Suiza cars, and for dash insulation by the Saurer car, made in Switzerland. Breda, maker of sleeping cars, is using it in these cars and in first and second class carriages.

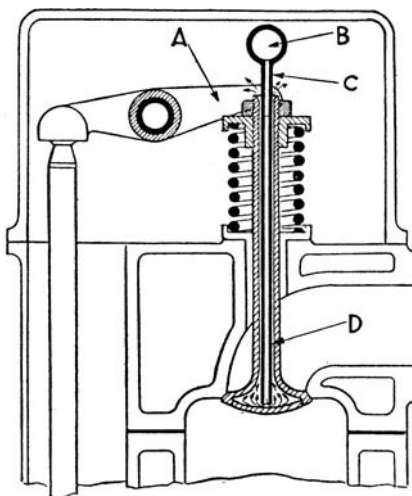
This progress follows the success of Seapak in this country in the transport plane field. Practically all American transports are Seapak insulated.

Oil-Cooled Exhaust Valves

THERE is no part of the aircraft engine which has to meet such severe operating conditions as the exhaust valve. The rise in the temperature of the exhaust valve is a constant difficulty and a frequent cause of pre-ignition. In the United States, salt-filled exhaust valves have been used extensively, and now we learn of an oil-cooled valve, invented by a well-known British engineer, R. C. Cross.

Our diagram shows the arrangement of a Cross oil-cooled valve in a form which may be applied to either an aircraft or an

automobile engine. A tube "B" is connected to the oil supply, and has attached to it a small tube "C," which passes through a hollow stem of the valve into the hollow valve head. Between the tube "C" and the walls of the hollow valve stem is a small annular space "D." The cooling oil passes through the tube "C," returns through the



Cross-section of an oil-cooled valve

annular space "D," and splashes into the overhead valve chamber. "A" is the valve rocker arm.

The Cross valve, of course, is applicable only to engines in which the overhead valve mechanism is totally enclosed. With the open type of valve gear found on many engines, the oil returning from the valve head and stem would be flung out, and, apart from the loss of oil, would make the airplane behind the engine intolerably dirty.

To convert any engine to the use of the oil-cooled valve it is only necessary to arrange for an oil pipe from the general supply and to bore out the valve guides to take the larger valve stems. Tests have shown that the new valve works well, and no carbonization of oil inside the valve stem has been noticed.—A. K.

Air-Conditioning the Airplane Sleeper

PULLMAN sleepers have, as we know, been air-conditioned for the last two or three years. The progressive airplane people do not lag a whit behind the Pullman.

In the air, the flying speed provides plenty of cool, fresh air, through the regulating system already built into the machine, and the exhaust heat of the engine also provides adequate heat when necessary. But on the ground, when the engine is stopped, these conditions do not obtain. Therefore, the Curtiss-Wright Airplane Company has provided an ingenious unit for use on the ground, which provides hot or cool air as desired.

This ground ventilating unit shown below the fuselage of the Curtiss-Condor in our photograph is a combination electric refrigerator, electric heater, and ventilator, thermostatically controlled. It can keep the cabin at a comfortable temperature at all times, and is powerful enough to change the air in the cabin completely in two minutes.

This unit fits under the airplane and distributes the air through the regular ven-



Air-conditioner for planes, in use at an airport

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.

DR. JULIUS KLEIN, *The Assistant Secretary*, U. S. Department of Commerce.

JOHN T. MADDEN, *Dean, School of Commerce, Accounts and Finance*, New York University.

HUBERT T. PARSON, *President*, F. W. Woolworth Company.

M. H. AYLESWORTH, *President*, National Broadcasting Company.

THOMAS J. WATSON, *President*, International Business Machines Corporation.

DEXTER S. KIMBALL, *Dean, College of Engineering*, Cornell University.

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.

CASE 3. Production Manager, salary \$6,000; now President, salary \$21,600.

Send for this Booklet

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.

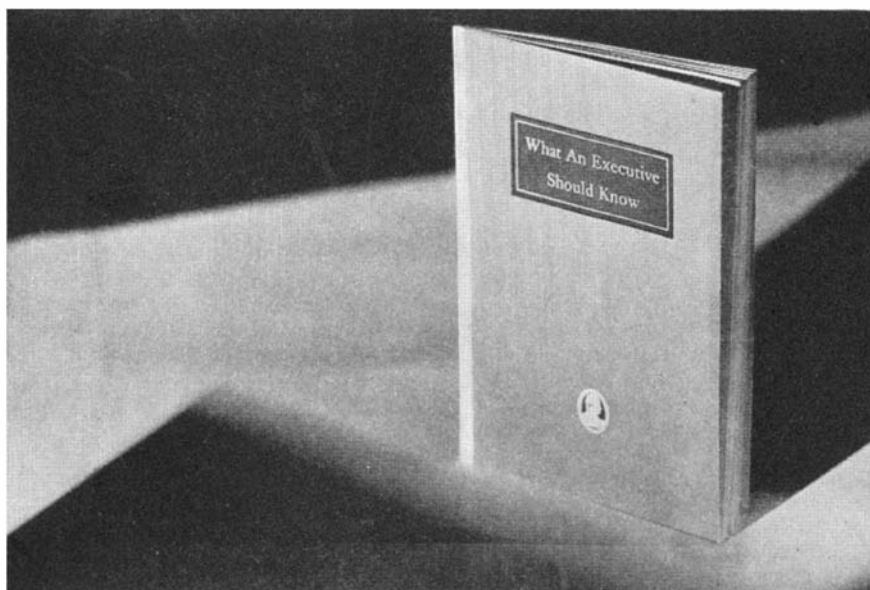
To the Alexander Hamilton Institute, 696 Astor Place, New York City. (In Canada, address Alexander Hamilton Institute, Ltd., C. P. R. Building, Toronto.)

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

NAME.....

BUSINESS ADDRESS.....

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.

tilating and heating channels. It might be argued that this is a superfluous comfort, since passengers never spend more time in the airplane than is necessary to get from point to point. This was true a short while back, but nowadays passengers get into an airplane sleeper in exactly the same way they get into a Pullman sleeper, and may be a couple of hours in bed before the ship flies away. Under these circumstances the new air-conditioning unit appears entirely logical.—A. K.

Copper Keeps Cut Flowers

WHEN cut flowers are put in copper vases, they remain fresh from one to three days longer, according to the findings of John Ratsek, floriculturist at the New York State College of Agriculture. In one test, poinsettias lasted 16 days, against eight days in a tin container.

This is due to the fact that some copper dissolves in water, says *Chemistry and You*, and hinders the growth of bacteria which cause flowers to wilt. Roses, snapdragons, stocks, delphiniums, primroses, carnations and other popular varieties of cut flowers keep longer.

Hobbies on Parade

SCIENCE dwelling in the American people to an unsuspected degree was revealed at the Hobby Show staged recently by the Toledo Museum of Art. The purpose of the show was to discover what Americans really are doing in their much discussed leisure time, and for that reason no restrictions were placed upon the exhibits. The privilege of exhibiting was limited to workers in a Toledo scale company, in order to control the number and the handling of exhibits.

Judges and directors of the show were surprised at one outstanding revelation; namely, that craftsmen, who all day engage in jobs demanding extreme precision, go right ahead and spend their spare time in exactly the same pursuit. To be statistical, the third largest classification of exhibitors, representing no less than 13 percent of the exhibitors, was this "extension of the job."



One of the exhibits at the hobby show; rifles made by a machinist

Chiefly confined to the tool makers, this feature brought out the fact that these men stay at their benches after working hours and use the company equipment to produce bevel protractors, sine bars, telescoping gages, angle plates, spring threading tools, parallel clamps, layout plates, universal V blocks, planer gages and so on. The instruments were made as a rule to work to one ten-thousandth of an inch, and were tempered, carburized, hardened, and ground as required. Much amiable rivalry was noted among the tool makers to produce a more beautifully finished and more precise instrument than the next fellow. When the maker finishes his product, he likes to use it in his regular work.

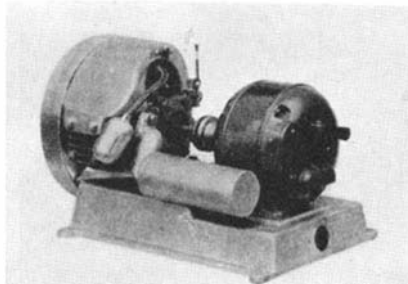
Smallest A. C. Electric Plant

THE gasoline driven generator unit shown in the photographs has been designed especially for use where a light,



Above: Portable A. C. power plant.

Below: Close-up of motor-generator



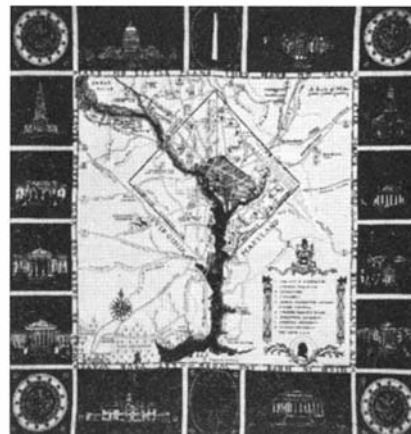
compact, and efficient electric plant is desired.

Though weighing only about 60 pounds, the unit may be used as a source of portable power for both long and short wave radio-phone transmitters and receivers, sound truck amplifiers, movie projectors, electric drills up to one half inch, and other electric tools and appliances.

For stationary installation, the base is fitted with suitable bolting down lugs and exhaust fittings to fit standard one inch pipe.

In designing the unit, every effort was taken to produce a machine which would be simple to operate and with which standard 110-120 volt, 60 cycle, A. C. equipment and appliances might be used without any auxiliary apparatus.

The generator, which is the secret of the unit's performance, is of unusual design. The most noteworthy fact about the Weco unit's system of voltage regulation is that



Handkerchief map described below

it is entirely built into the generator and requires no mechanical parts, resistances, choke coils or any other auxiliary apparatus.

In mechanical construction the generator resembles the type used in large power plants throughout the world. The only moving part is the rotating field to which field current is conducted through two brushes. Since the field voltage is only in the neighborhood of thirty volts, the difficulties encountered by using higher field voltages are eliminated. The armature, which is stationary, carries one winding for field excitation, one for voltage regulation, and one for power output.

The gasoline motor used on this unit is of the two-cycle type, simple in construction and operation and very reliable. An improved air cooling system insures adequate cooling for both engine and generator, and a sensitive governor maintains proper engine speed.

The aluminum base of the unit contains a gasoline tank and a filter compartment in which is enclosed a filter to eliminate radio interference from the generator brushes. For convenience in making electrical connections to the generator, a conventional type of convenience outlet is located in the aluminum base.

The entire magneto and ignition system of the engine is shielded to prevent radio interference.

The complete unit is 18 inches long, 12 inches wide, and 12 inches high and may be easily carried on a packboard. It is suitable for operating 110-120 volt 60-cycle A.C. equipment not requiring more than 350 volt-amperes or for lighting up to five 100-watt Mazda lamps or equivalent.

Handkerchief Maps of Washington

THE United States Government having decreed that this year shall be known as National Park Year, the Handkerchief Maps of Washington, now made available by the American Civic Association, a private organization, are very timely.

The purpose of these maps is to raise funds for the building of the George Washington Memorial Parkway. This 14-mile stretch, when finished, is to become another National Park, thus bringing to a successful conclusion George Washington's dream of a through right of way along the Potomac River, from Mt. Vernon to Great Falls, and at the same time preserving forever the natural beauties of the Falls.

From an historical standpoint, it is interesting to know that in 1792 and 1796 George Washington printed handkerchief maps of "the New Federal Town" as Washington was then called, in order to promote the sale of dwelling sites there. One of each of these original maps now hang in the Congressional Library.

The American Civic Association, needing land for the continuation of the Parkway, adopted George Washington's idea. The original Pierre L'Enfant map of Washington, contained in the original handkerchief maps, has been used as a basis on which to depict, on the present maps, the growth of the nation's capital since that time.

These maps have many uses; they may be framed, or made into bags, quilts, luncheon sets and aprons. Size 28 inches square; material, fine lawn; colors, terra-cotta, plum, brown, green, and red, on a white background. Further information may be had from the American Civic Association, 901 Union Trust Building, Washington, D. C.

Science Course for Professional Gardeners

HORTICULTURE in the United States has been unduly neglected as a profession, largely because of the lack of opportunity for gardeners to gain a knowledge of the sciences underlying their work. European institutions have long given specialized training to men working with plants, the completion of which is sometimes equivalent to a college degree in any other profession.

The first attempt at offering scientific training to gardeners in the United States is being undertaken by the New York Botanical Garden, which on October 1 is opening the third year of its Science Course for Professional Gardeners. While not yet as extensive or as intensified a course as that offered, for instance, at Kew, upon which it is modeled, this course is giving a valuable education to gardeners, both old and young. While the older men, most of them superintendents of large estates, are taking the work chiefly as a means of strengthening their foundations in their profession, to the younger men it means a definite chance for advancement. And as they advance, the practice of horticulture in America gives promise of advancing under their direction. It has hopes of rising from a mere trade to the rank of a profession.

Subjects taught to the gardeners are those branches of science which most directly affect their work—systematic botany, morphology and plant physiology, soils and fertilizers, entomology, plant pathology, and breeding. Classes meet every Monday night for two terms of 12 weeks each.

Diet Dislodges Lead from Body

ASPECIAL diet which was helpful in treating cases of lead poisoning was reported by Dr. Irving Gray of Brooklyn at a meeting of the American Medical Association. Lead poisoning is one of the greatest of all industrial hazards.

The diet is one which contains much phosphorus and little calcium. It helps in getting the lead out of the body, actually dislodging it from the tissues where it has

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been deposited. The diet treatment is based on the discovery of American investigators that the storage of lead in the body tissues is favored by a high intake of calcium, while elimination of lead is increased by lowering the calcium intake.

Dr. Gray reported four cases of persons who had worked with lead for only a few months. "Deleading" by diet and medicine removed the lead from their systems in two weeks. In three other cases so much lead had been deposited that it required three or four courses of treatment to "delead" the patients.

Too rapid "deleading" may prove dangerous. Consequently Dr. Gray advises that the treatment be carried out in a hospital.

The diet includes such foods as eggs, whole wheat bread, lamb chops, liver, green peas, pineapple juice, baked potatoes, and halibut, which all contain large amounts of phosphorus. Phosphorus, it has been found, literally pulls the lead out of the tissues and eliminates it from the body.

All milk is omitted from the diet because milk is the most important dietary source of calcium.—*Science Service.*

Midnight Paintings

FLUORESCENT paint is becoming popular. Even fan dancers are using it now. The fans are thus made luminous in the dark—the dancers invisible.

Paintings which glow in the dark when invisible ultra-violet rays are thrown on them are called fluorescent. They emit a



Example of a "midnight painting"

weird, unearthly light, akin to phosphorescence, and are being used for murals. A photograph of a wall painting of this kind, by the Switzer Brothers Ultra Violet Laboratories of Berkeley, California, is reproduced. In daylight the surface on which the original of this was painted appears to be white. At night, when illuminated as described above, the wall disappears and the painting appears in soft green.

Fluorescent paints are used on stage costumes and scenery, for painting any kind of pictures, in advertisements, and on many other objects. They are available in different colors.

Fluorescence is simply absorbed light which happens to be of a wave-length that

is invisible to the eye (ultra-violet), transformed by the substance it strikes into light of a longer wave-length which is visible to the eye. Phosphorescence is akin to fluorescence, and both are forms of luminescence.

Carbon Black Production

AMERICAN manufacturers produced 269,325,000 pounds of carbon black in 1933. Made by burning natural gas and collecting the "soot," carbon black manufacture consumed about 12 percent of the natural gas used in this country last year. It takes 1000 cubic feet of natural gas to yield 1.44 pounds of carbon black.

According to the United States Bureau of Mines, the carbon black industry has moved steadily westward for a number of years, but the center of production took a step eastward in 1933 when Louisiana showed the largest increase of any of the major producing districts. Although the Texas Panhandle increased production only 7 percent over 1932, it produced 190,356,000 pounds or 71 percent of the total output for 1933. Average value of carbon black at the plants, which has declined steadily since 1928, showed a slight gain in 1933, being 2.77¢ per pound, compared with 2.75¢ in 1932. The total value of carbon black produced in 1933 was 7,449,000 dollars. This compares with 6,664,000 dollars in 1932.

U. S. Has 43 Percent of World's Radio Sets

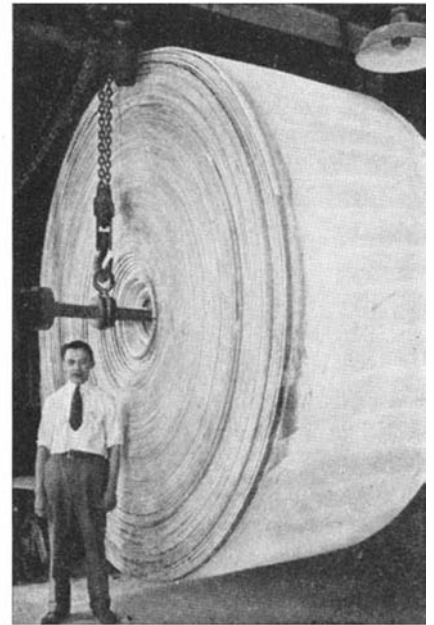
THE United States not only leads the world in its number of radio sets, but comes near having more than all of Europe.

Statistics just compiled by the United States Department of Commerce give the radio census of the United States as 18,500,000 sets as compared to a world total of 42,540,239. Europe has 18,594,605, total.

16 Bales of Cotton for Conveyor Belt

THEY make them big in Passaic, New Jersey. Witness our illustration which shows one of the world's largest belts.

Built for a limestone plant by The Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., this single-



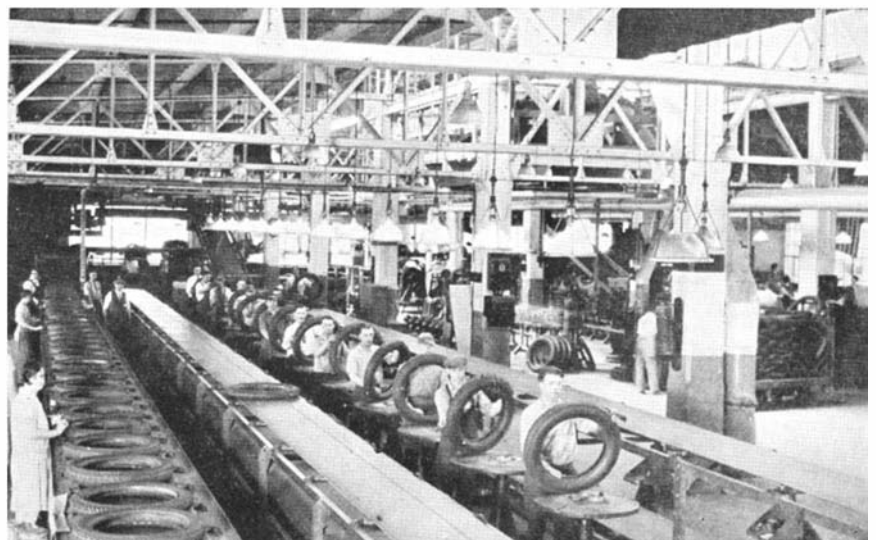
A belt 1291 feet long, made from 16 bales of cotton, weighing 11 tons

piece rubber conveyor belt is nearly a quarter of a mile long (1291 feet) and four feet wide; over 5000 square feet of tough rubber. It is seven by nine ply heavy duck construction with a ¼-inch reinforcement on top and a ¼-inch reinforcement on back.

Sixteen bales of raw cotton were used in making it. It weighs 11 tons and will deliver 1500 tons (136 times its own weight) of crushed limestone every hour.

America, Do You Want Your Elms?

IF America wants her elms, apparently she will have to exterminate the Dutch elm disease which has invaded an area of some 3000 square miles in New Jersey, New York, and Connecticut. The greatest concentration of the disease is still confined to an area of about 1700 square miles. Up to July 31, approximately 6500 trees were known to be infected. Of these, about 4000 are still standing and 2500 have been removed by federal, state, municipal, and private means.



Tires contain about 90 percent of carbon black produced in the United States

Elm trees estimated to be from 75 to 150 years old which two weeks ago showed no external signs of the disease today stand dead. Nothing can now be done except to remove and burn them. Highly prized elms on which the owners have spent hundreds of dollars for surgical work in an effort to save them from decay and other troubles are killed almost overnight by the Dutch elm disease.

The disease was first found in this country in 1930. It has been known in Europe for approximately 16 years, during which time it has proved very destructive.

A diseased tree cannot be treated; it must be removed and burned. It is believed that a small beetle which infests the trees carries the disease to uninfected trees. If diseased and beetle-infested trees are not removed and immediately burned, the beetles leave the infested trees and move to uninfected trees. Thus the disease is rapidly and widely spread.

The indications are that unless a vigorous, consistent program is carried out to remove and burn every infected tree, the elms of America may follow the American chestnut to almost complete destruction by disease. All the United States Department of Agriculture can do with the limited funds at its disposal is to conduct scouting operations to find the diseased trees and co-ordinate the eradication activities, although some money is being spent to take out trees which are obviously most dangerous to areas not yet infested and which otherwise would not be removed in time. If individuals, cities, counties, and states will at once undertake and aggressively carry out the right kind of a program of eradication, there is a fair chance to eradicate the disease. Failure to do this probably means dedicating the elms of America to disease and death. The question is: Do you think enough of your elms to save them?

Search for Harmless Morphine

TAMING morphine to be the perfect servant of medicine, without the dangers of drug addiction and poisoning which now accompany its use, seems within the realm of possibility, as a result of co-operative work between the Universities of Michigan and Virginia and various Government bureaus, report Drs. Charles W. Edmunds and Nathan B. Eddy, of the Michigan Medical School.

Ridding morphine of its habit-forming and toxic properties is proceeding as a complicated chemical juggling of the parts of the morphine molecule, said Dr. Edmunds and Dr. Eddy. Like most substances of organic origin, morphine is a very complicated union of carbon, hydrogen, oxygen, and nitrogen. The morphiun molecule is pictured as consisting of a nucleus of phenanthrene, a common coal-tar derivative, to which are attached several "chains" and "rings," each consisting of different atoms in varying proportions. These chains and rings and their exact attachment to the nucleus furnish the chemical explanation of why morphine acts as it does in the body.

Knocking some of these chemical hangers-on from the nucleus, or "muzzling" them with other chemical groups, produces new derivatives which affect the body differently from the original product. This part of the work has been done by University of

(Please turn to page 213)

Are You Afraid to Eat Starch and Protein Foods Together?



That is only one of the current food fads debunked in the October HYGEIA. Food faddists urge us to "eat more" of this food and that, to avoid "mineral deficiency," to eat raw foods and whole grain flours and cereals, and not to eat certain foods combined.

But these ideas are in the same class with the old superstitions that onions will cure a cold or tomatoes cause cancer.

Some food fads are not merely foolish; they are downright dangerous. So it will pay you to get the facts about "Food Fads and Faddists" in Marion R. Farren's article in the current issue of HYGEIA.

Read These Also in the October HYGEIA

The Eye Book

Want to Be a Doctor?

Common Sense in Mouth Care

The Parent and the Handicapped Child

What Is "Sinus Trouble?"

Dental Dens

As the Twig Is Bent

Does Your Child Walk Correctly?

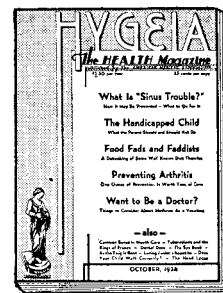
Tuberculosis and the Kings of France

Preventing Arthritis

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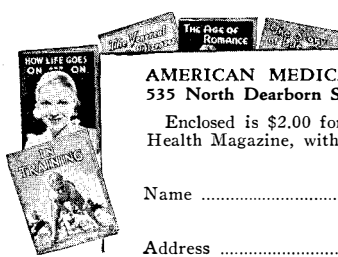
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THE AMATEUR ASTRONOMER

Conducted by ALBERT G. INGALLS

ONE night last summer James T. Barkelew and Byron L. Graves of Los Angeles, with Russell W. Porter of Pasadena, went off on a jaunt in the California hills, taking along with them Barkelew's small reflecting telescope. Porter was so impressed by a slow-motion wrinkle which Barkelew has applied to a simple telescope that he made the sketches shown below. The wrinkle consists of a thumbscrew working in a half nut, and the virtue of it is that, while the springiness of the arm and a piece of spring brass to which the nut is attached holds it to whatever part of the screw it is placed against, it can be lifted off and shifted at once without a second's fuss. Barkelew has this wrinkle on both his R. A. and declination motions, and he writes that "if anyone is foolish enough to want to make one, I can tell him how this one can be improved without making it too fussy." His address is Great Republic Life Building, Los Angeles. This looks like a wrinkle well worth copying—study it over. Barkelew is the man who is interested in automatic photo-electric telescope guiding and who described his ideas on that subject in the August number.

ON the opposite page at the bottom you will see a picture of a grinding machine made by Clark B. Hicks of the Amateur Telescope Makers of Indianapolis, of which V. E. Maier, 1306 Parker Avenue, that city, is secretary. Maier writes that Hicks' machine works just as smoothly as the best steel ones, although it is made entirely of wood with babbitt bearings. All the rotating parts are below the top of the table. The originality of this piece of work is manifest in the photograph: the lever at the right-hand corner, for adjusting the length of the stroke while running, the "model T" drag link with ball and socket joints at either end,

making the mirror "full floating," and the improved Lee ratchet eliminating all bevel gears and driving rods on the link. By adjusting the transverse arm the equivalent of an elliptical stroke can be produced.

WE learn that the Corning Glass works has supplied a 24-inch disk of Pyrex to the College of Puget Sound, Tacoma, and that the Amateur Telescope Makers of Tacoma will grind, polish and figure this mirror. Alan R. Kirkham will have charge of this job, with George Croston assisting. More amateurs doing professional work!

HERE is A. W. Everest's latest revision of the previous revisions of the revised methods of using HCF laps, complementing or supplanting Part VIII of "Amateur Telescope Making." Everest writes:

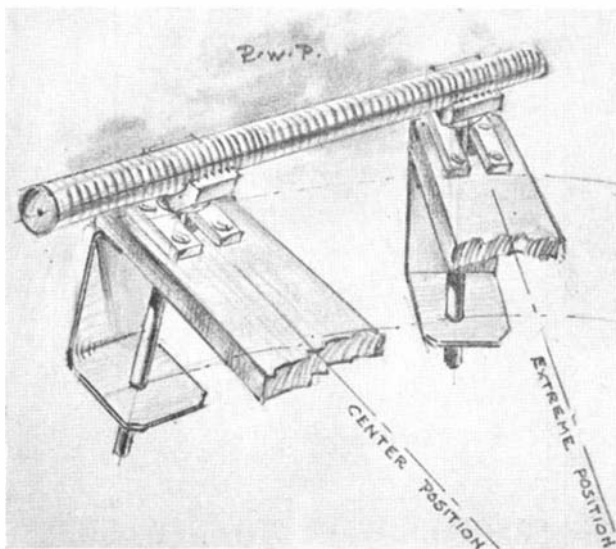
"We use HCF on the tool for bringing to a complete polish, paying no attention to the figure until then. Embed the HCF

in a very thin layer of soft pitch—pitch in which at room temperature one pound pressure with the thumb nail will make a quarter inch dent in one second instead of the five seconds usually allowed for a pitch tool. The pitch layer should be thin enough so that the HCF will sink right through to the glass and become *unyielding*. It will maintain contact by *wearing*. After forming, dash on some water and rub all over lightly with a cake of Ivory soap. Then work the mirror back and forth a few times to produce a fine, bubbly suds before applying the rouge and water mixture; otherwise the rouge won't stay in place.

"The polishing action of the HCF tool must be kept in mind if you are to maintain top speed. Practically no rouge granules become embedded in the surfaces of the facets, as in the classical pitch tool. It is the wedge of rouge granules that forms at the *edge* of each facet during each individual stroke that does the work. On the reverse stroke this wedge breaks away and another forms on the opposite side of each depression—and so on, back and forth. From the above you can see that only a small amount of the rouge in the mixture can be effective. Surplus rouge is worse than useless, as it piles up to the extent that it rolls over the facets, wearing them down too fast. A heaping teaspoon in half a glass of water is sufficient. If you can look through the mirror and see all the facets as you work, all is well.

"For the final figuring I recommend a pitch tool."

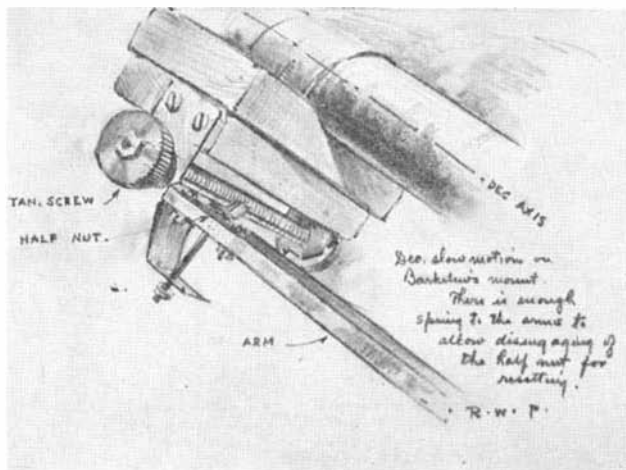
Norman Shillinger, 403 Commerce Street, Wilmerding, Pa., finds that cutting channels in a lap under water will prevent chipping the lap—like cutting glass with shears under water.



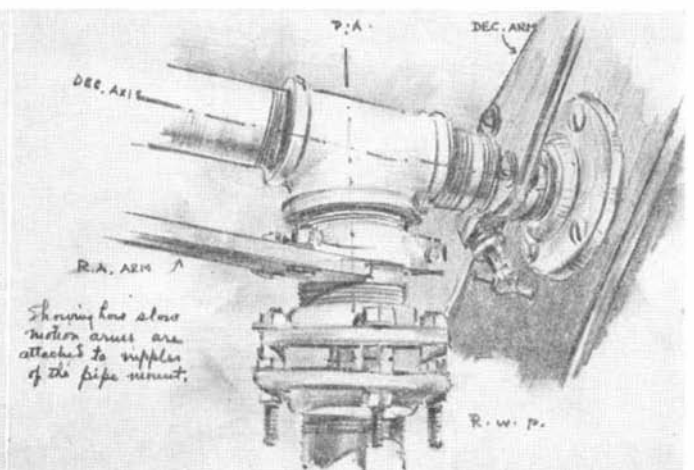
Drawings by Russell W. Porter

This shows how the half nut always stays engaged on the tangent screw by swiveling in the slots provided

HERE is a letter received from Clayton R. Tinsley, president of the Tinsley Laboratories



Declination slow motion on Barkelew's mount. There is enough spring to the arms to allow resetting half nut

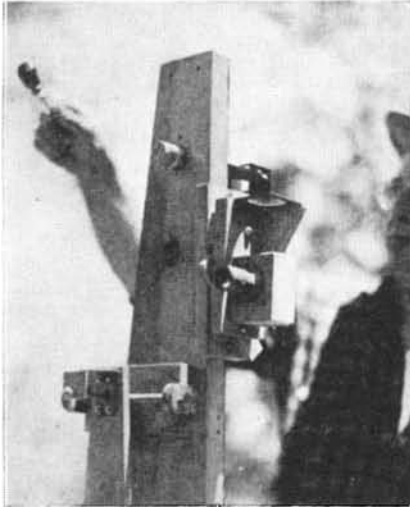


This illustration is virtually a continuation of the one to the left—same declination axis and same arm, except turned a bit

in Berkeley, California (3017 Wheeler Street):

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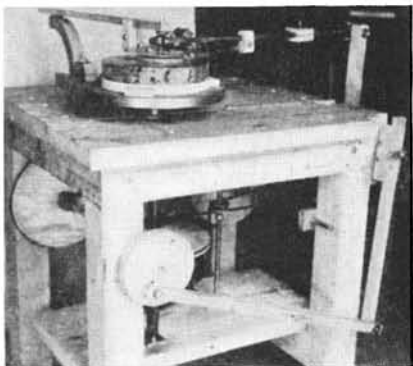
"Take a small reading glass or other simple lens and, using it as a burning glass, throw a bright spot upon the supposed



Declination arm attached to a mount like that in A.T.M., page 29

polished surface. Either an electric light or the sun may be used, though the latter is much the better. A surface which seems quite fair using a magnifying glass in the usual manner will now appear as a gravel bed even to the naked eye. If the test seems too drastic, try it out on a professionally polished surface, such as a B. and L. prism. If the prism surface is clean and free from grease, even the most intense 'burning glass' spot can scarcely be detected by front face reflection."

At the risk of being lynched, your scribe will add that he is suspicious that many of the short, two- and three-hour polishing jobs



Grinding machine—Hicks

he constantly hears of will not pass this test. Please accompany future claims with affidavits sworn on A.T.M.

The old chestnut about local figuring with the ball of the thumb is up again for discussion. We wrote to J. W. Fecker for his opinion. His reply was: "This is definitely one of those myths the origin of which nobody knows, but it nevertheless persists." In spite of this we frequently hear that this was the lost, secret method used by the great professionals. We are from Mo.



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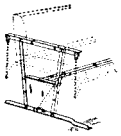
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RECENTLY PATENTED INVENTIONS

Conducted by A. P. PECK

PORCH GLIDER CONSTRUCTION

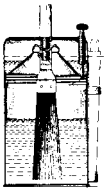
Patent Number 1,962,917, Milton B. Smith. An easily handled frame for porch and lawn gliders of the type having a back and seat so supported that they swing between upright frames



is one of the main objects of this invention. This particular type of frame construction makes it possible to assemble or disassemble the frame of the glider without the use of bolts and nuts, and to erect or knock down the frame conveniently and without the use of special tools or connecting devices. When this glider frame is assembled, parts of it are rigidly fastened together by riveting or other suitable means while other parts are so arranged as to be easily connected through locking joints. The accompanying drawing shows one end of such a glider frame in which the horizontal bar connecting the two vertical supports holds them rigidly by means of notches in the ends and swinging arms which are securely locked into position by means of latches engaging lugs located at the proper points on the vertical frames.

PAINT BRUSH AND CONTAINER

Patent Number 1,959,441, Harry Oscar. This invention relates to brushes as used in applying such liquids as paints, varnishes, and lacquers, and the receptacles in which the brushes are placed when not in use. One of the objects is to provide a practical means to catch and retain all drippings from the brush during use and thereby prevent not only the waste of material but also soiling the hands of the user.



The receptacle which is a part of the invention is so designed as to be airtight and to contain both the liquid and the brush when not in use, thereby preventing the brush from drying out and maintaining it in condition for instant use. In the airtight container is formed a "vacuum" trap. The partial vacuum can be released by turning a needle valve provided.

TYPEWRITER KEY

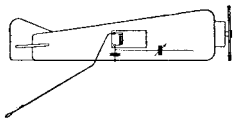
Patent Number 1,967,721, Garry W. Munson and Eugene Hebel. The present invention relates to improvements in spring actuated keys for typewriters adapted to be fitted to the keys of existing machines. One object of the invention is to provide a very compact key, the upper member of which is so supported that it can slide telescopically within the lower member, the two being normally supported by means of a spiral spring. Another object is to provide a key of this type which is simple in construction, efficient in operation, and economical to manufacture. The drawing herewith shows the general design, in cross section, of this invention.



such as in the case of an airplane. These systems have taken the form of shielding, and filters composed of inductances, capacities, and so forth. These systems are not always satisfactory because of various drawbacks, and it is the purpose of the present invention to produce an interference elimination method which will make possible satisfactory radio reception under

AERIAL SYSTEM

Patent Number 1,967,604, Harold H. Beverage. Various systems have been proposed in the past to eliminate the radio interference set up in the vicinity of an internal combustion engine



as in the case of an airplane. These systems have taken the form of shielding, and filters composed of inductances, capacities, and so forth. These systems are not always satisfactory because of various drawbacks, and it is the purpose of the present invention to produce an interference elimination method which will make possible satisfactory radio reception under

Preserving Proof of Invention

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

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

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

the stated conditions. In this case a trailing aerial of conventional design is used, as shown in the diagram, while another wire is installed to pick up the disturbances and feed them into the radio receiver. Here a bridge circuit is provided in which the disturbing currents are cancelled out. This is accomplished by feeding the two picked up interfering currents into the bridge circuit out of phase. Thus the interfering circuits will not continue into the receiver and ordinary reception can be carried on with a minimum of difficulty.

VENTILATOR

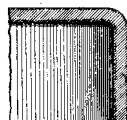
Patent Number 1,967,504, John J. Gaughran, Jr. and Edward Gaughran. It is the purpose of this invention to provide a ventilator for railway cars, buses, and automobiles which can readily



be installed in connection with existing windows or similar openings. The particular feature of the invention, as shown in the drawing, consists of the arrangement of a trough-like baffle plate mounted within a hood which will effectively prevent drafts within the compartment while at the same time will freely permit foul air to be exhausted from the interior. The movement of the vehicle in which this ventilator is installed creates a suction which readily draws the foul air from the compartment, the trough-like baffle plate preventing the outside air currents from creating a draft within.

BRAKE DRUM

Patent Number 1,966,130, Raymond J. Norton. Several things are to be desired in a brake drum such as those used in automobiles. The interior surface should have a high coefficient of friction and at the same time should be wear-resistant. The drum should be capable of dissipating heat as rapidly as possible, and should be resistant to corrosion. The present invention has as its object to provide a brake drum of composite struc-

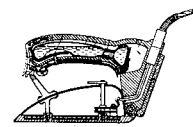


ture which will have all of these desirable qualities. The brake drum is made of a material such as low carbon steel, formed in the usual manner. Then the interior surface is subjected to a case-hardening process so as to render this portion of the drum harder than the remainder. Then the exterior surface may be treated so as to increase its resistance to corrosion and also its heat emissivity. This is done by forming on the surface a skin or coating of aluminum oxide by means of anodic oxidation.

SADIRON

Patent Number 1,965,746, Michael N. Matveyeff.

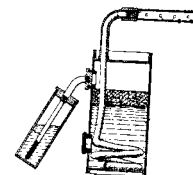
One of the dangers of using ordinary electric sadirons is that if they are left on the work unattended for any appreciable length of time there



is a possibility of burning the material being pressed. In the present invention means have been provided for eliminating this trouble. Springs and a movable weight are so provided that when the hand of the operator is removed from the handle of the iron the handle will spring backward, shifting a movable weight and causing the working face of the iron to be lifted from the material being pressed and held upward at an angle. The drawing herewith shows how this is accomplished, a latch being provided at the forward end of the handle, which latch closes only when the operator's hand is on the iron. The movable weight consists of a quantity of mercury contained within the handle. When the iron is in its tilted position, the current remains on.

BLOW TORCH

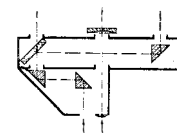
Patent Number 1,966,252, Lester L. Lasher and Arthur Goddu. One of the serious difficulties with automatic blow torches, as ordinarily constructed, has been the inability of the torch to



operate at maximum efficiency when the torch is tilted to an unusual angle such as may be required by some particular job. When this happens the alcohol or other liquid fuel rushes into the space normally occupied by the vaporized gases when the torch is upright and so causes a diminution and in some cases an actual extinction of the flame. In the present invention a plug or barrier is inserted in the fuel chamber, as shown in the drawing, through which the wick passes. Thus the liquid fuel is retained in position in the bottom portion of the tank and space is reserved in the upper part for the volatilized gases. Other improvements in the construction of automatic blow torches are described in detail in the patent specification.

CAMERA

Patent Number 1,967,279, Oskar Barnack. Where distance meters are used on ordinary cameras, it is usually necessary for the operator to move his line of vision from the distance meter



to the view finder before he can complete his exposure. In the present invention a system of prisms and mirrors is so arranged that the operator can use both the view finder and the distance meter or range finder merely by moving the eyeball slightly. As shown, one line of vision is straight ahead through the view finder. By shifting the line only slightly to one side, vision is through the prisms and mirrors of the range finder. Thus it is possible to make accurate exposures with a minimum of inconvenience.

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

**THE SCIENTIFIC AMERICAN
DIGEST**

(Continued from page 209)

Virginia chemists who have produced dozens of different compounds, many of them new to chemical literature.

Next, these morphine derivatives are sent to the University of Michigan, where their action is studied on animals and compared with morphine. Most striking so far is a compound which, although only three times as toxic as morphine, possesses pain relieving qualities 10 times as great, and 30 to 40 times the general depressant effect. This derivative, dihydrodesoxymorphine-D, might be given in small doses with greater general effect and less toxic danger than a large dose of pure morphine. It was made by removing one of the side chains from the phenanthrene nucleus and replacing it with hydrogen. Certain of the new compounds, which have been made and which appear most promising for medical uses, are being tried out on human patients to see whether or not they possess addicting properties.



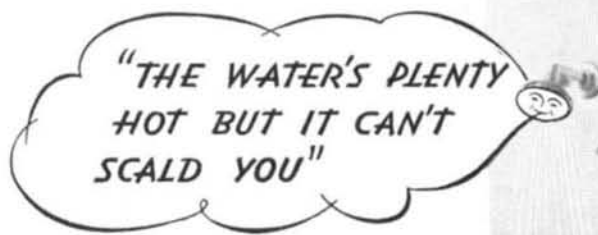
Courtesy Lavashower, Inc.

This space-saving unit for modern bathrooms may be installed in a space no larger than five by seven feet, yet it provides a complete lavatory and bath tub with shower. The tub is recessed under the lavatory, giving all the advantages of a standard tub. The other support of lavatory is a towel cabinet

Yellow Glass

INDIUM, the rare metal with which scientists are just becoming acquainted, was so named because its discoverers found that it produced indigo blue lines in its spectrum. It seems odd that a substance so historically associated with the color blue should find a new and promising use in coloring glass yellow. William S. Murray, of Utica, New York, who is devoting himself to the study of this little-known element in an effort to find commercial uses for its unique properties, has recently found that indium sesquioxide imparts a beautiful yellow color to glass, ranging from light canary to dark tangerine-orange, depending upon the amount of indium used.

Heretofore, the production of yellow glass



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This may seem a "little thing". Many hotels do not provide it. But it is further proof of how Statler Hotels accept, as a duty, the constant protection of your health and comfort . . . the provision of every feature essential to complete satisfaction.

While we're in the bathroom, let's look at some other "little things". There's a towel hook placed at convenient height . . . a water mixer valve to regulate the temperature of the shower with a simple twist of your wrist. The shower itself is something you've probably taken for granted . . . but few hotels have followed the Statlers' lead in providing a shower in every bath.

Space permitting, we could list dozens of such things . . . "little things" we have discovered in our pursuit of perfection in hotel service. Clean, new pen points, both "stub" and "fine" . . . fresh, free-flowing ink . . . a pin cushion with its quick-repair supply of buttons, pins and threaded needles . . . a gadget for hanging trousers properly . . . the convenient desk calendar . . . a telephone-attached memorandum pad, etc., etc.

And when it comes to slumber, no one could be more solicitous than we of your comfort. You lie on a luxurious inner-spring hair mattress, with its protector pad to give unusual smoothness. Your downy pillows are sheathed in sanitary inner slips as well as snowy white outer ones. You sleep better because we have thought of such things as sound-proof floor and wall construction . . . felted, double connecting doors . . . controlled volume of your neighbor's radio . . . supply carts with rubber tires and bumpers . . . even an ingenious device outside your door to tell employees the room is occupied and the door locked . . .

Some of these things you get at some hotels. All of them you'll get only at a Statler. To them we add an unparalleled service, rendered by a staff of selected, trained employees.

From whatever angle we approach our story, the conclusion is the same: Statler Hotels are fulfilling a self-assigned obligation to pioneer in the development of new ideas that will continually add to the pleasure of staying at these hotels . . . and to give you complete hotel service—Statler Service.

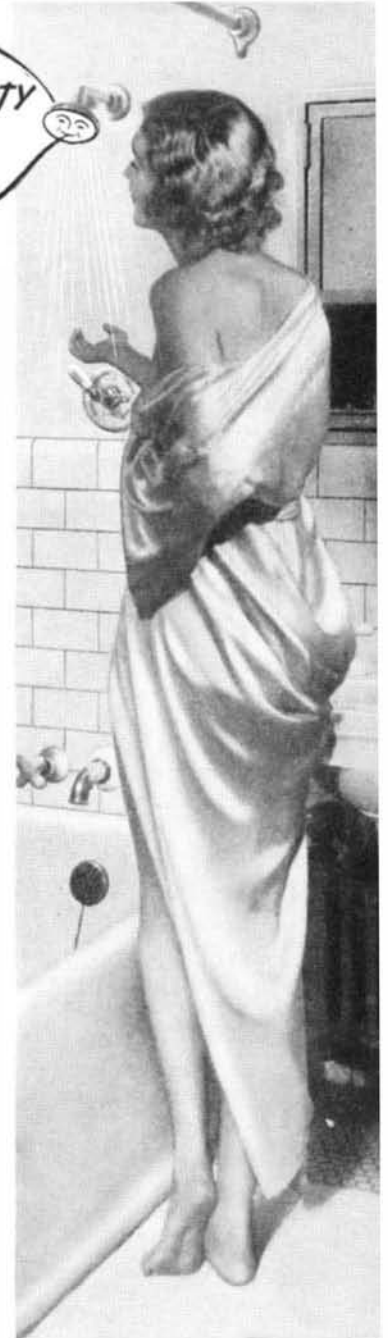
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Air Conditioning

By J. A. MOYER and R. U. FITZ

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SCIENTIFIC AMERICAN
24 West 40th St., New York

has depended on compounds of uranium, cerium, and titanium. The uranium hydrate has a greater coloring power than any of the usual compounds. Cerium and titanium have been used together in rather substantial amounts but the color is lighter than is desired. Uranium gives a canary yellow color.

So far as has been determined, indium sesquioxide gives a more intense yellow color than any of the other oxides used. One-half pound imparts a beautiful yellow to 1000 pounds of glass-forming materials. This amount is about one seventh that of the metallic oxides previously used for coloring glass yellow.—A. E. B.

European Shelterbelts Help Modify Climate

PRESIDENT Roosevelt's plan for the establishment of a vast shelter belt of trees across the drought-stricken Great Plains, while representing by far the largest reforestation project of its kind ever undertaken in this country, is not the first attempt ever made to modify climatic and agricultural conditions by tree planting, according to the Forest Service, United States Department of Agriculture.

One of the most famous large-scale tree-planting projects was begun more than 60 years ago on the steppes of southern Russia, where conditions are in many ways similar to those of the prairie regions of this country. Protection forest strips were planted over thousands of acres as a defense against the "black dust storms" caused by the heavy winds which raged over the plains. Studies show that the forest belts reduce the average wind velocity between the strips by 35 percent during summer and about 20 percent during the winter. Evaporation of moisture between the strips, as contrasted with open prairie areas, is reduced by 30 percent, and yields of grain in a typical dry year were more than a quarter ton per acre greater than in the open prairie.

The Landes region of France is another striking example of the conquest of man over the inimical forces of nature. Forest planting here has reclaimed thousands of

acres of waste lands and has vastly improved living conditions. Large-scale forest plantings have also been carried on in more recent years in Italy and Hungary for the reclamation of waste lands and the prevention of erosion.

A notable reforestation project was begun by the Forest Service some 30 years ago in western Nebraska, and a green, growing forest, already yielding some timber, now covers thousands of acres of what were formerly barren sandhills. The area is now the Nebraska National Forest.

The Forest Service has made extensive studies of existing wind-break plantings in Nebraska and Kansas, and has found windbreaks effective in reducing surface velocity of the wind to a distance at least 20 times the height of the trees. Their effect in conserving soil moisture, preventing movement of the soil by winds, and in increasing crop yields has also been noted.

Dinitrophenol Dangerous

THE "reducing racket" has a group of new and dangerous drugs, dinitrophenol and related compounds. Racketeers are selling these drugs in fat reducers in spite of reports of deaths caused by their compounds, says W. G. Campbell, Chief of the Food and Drug Administration. "Reducing agents containing these drugs," says Mr. Campbell, "have sprung up like mushrooms all over the country, and are endangering the lives of patrons. The Federal Food and Drugs Act has no jurisdiction over products of this type, dangerous though they may be. All that the Food and Drug Administration can do is to warn the public that these compounds are dangerous."

Clinical evidence shows, Mr. Campbell said, that these drugs act by increasing the metabolic rate. This amounts to a speeding up of the body processes, resulting in a destruction of the tissues, including fat, to provide fuel for the accelerated metabolism. Common symptoms are increased temperature, pulse or respiration, or copious sweating. In particular, Mr. Campbell warned, these drugs should not be used by individuals suffering from chronic rheumatism, alcoholism, tuberculosis, or diseases of the



A view of the three-inch nozzle used in sluicing off the overburden on a quarry at the site of Norris Dam on the Clinch River, Tennessee. Water was used at a pressure of 100 pounds, and the overburden was washed off (Continued at right)

heart, liver or kidneys, as poisonous and otherwise harmful effects are even more likely to manifest themselves. There is also some evidence that they may cause profound disturbance of the blood-forming organs.

These drugs, in common with many others, may serve a useful purpose when the dosage is properly adapted to the needs of the individual patient, provided there are no contra-indications to its use. Proper dosage and indications for use, however, as well as prompt discovery of toxic effects, can be determined only by a skilled physician. Furthermore, there may be unexpected harmful effects that are not disclosed by the first tests. Such effects can be determined conclusively only after extensive trial and use, in addition to the tests which should in all cases be made before the preparation is offered to the public.

Mercury-Made "Sunlight"

MERCURY, the liquid metal which we knew as the fascinating quicksilver in childhood days, is responsible for a new light source that is expected to exert considerable influence on artificial lighting practice of the future. This new light source was developed in the engineering laboratories of the Westinghouse Lamp Company and is known as the high-pressure mercury lamp.

The principle of producing light by bottling metallic vapors and then passing an electrical charge through them was the basis of the sodium lamp invention by the Westinghouse engineers in 1917. It was not until 1932, however, that suitable glass, which would withstand the deteriorating chemical reaction of sodium vapor, was developed. The success of this research paved the way to the high-pressure mercury vapor lamp.

Perhaps the outstanding feature of the high pressure mercury lamp is its high operating efficiency. The use of vaporized mercury as a source of light is in itself nothing of revolutionary character. For a number of years, low pressure mercury lamps have been in use, but their efficiency is on the order of 15 to 20 lumens per watt.

In the new lamp mercury in an inner tube is vaporized by an electric arc and the pressure kept relatively high through the maintenance of a high operating temperature. In this way, it is possible to obtain efficiencies of 35 to 45 lumens per watt. The resultant light is distinctly bluish-white in color instead of the bluish-green of low pressure design.

The glass inner tube, which is approximately 7½ inches long and 1¾ inches in diameter, contains a drop of mercury which is vaporized by the electric arc. There are two electrodes at each end of this inner tube. The arc is established between these electrodes. One of the reasons for constructing the lamp with two tubes was to provide a means of conserving heat. The outer tube or the apparent lamp bulb acts as a jacket. In the space between these two bulbs is nitrogen gas at approximately one half atmosphere pressure. This gas prevents arcing between the metal parts which hold the inner tube firmly in the lamp bulb. The ends of the inner tube are coated with a gold paint which reflects heat back into the inner tube and further contributes to a constant high temperature.

The electrodes in the ends of the inner tube are coils of tungsten wire. Trapped in each coil, however, is a small slug of a special chemical compound which supplies a copious flow of electrons from the time the lamp first begins to operate.—A. E. B.

Wiley Post's Altitude Suit

THE indomitable and skilful Wiley Post is planning to fly in his globe girdling airplane, *Winnie Mae*, from London to Melbourne, Australia, in two days, in an attempt to capture the first prize of 10,000 pounds in the MacRobertson International Air Race. Post plans to make the England-Australia flight at an altitude of approximately 30,000 feet, and with his highly supercharged engine and Smith controllable pitch propeller hopes to attain a speed of 300 miles per hour in the thin air of this great height.

Of course the equipment needed for this feat is of considerable complexity. Not the least part of this will be a special altitude



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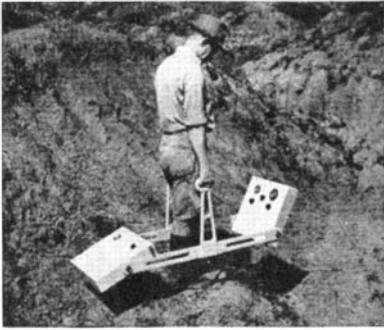
Town State



(Continued from left) the hillside to be caught in a series of check dams. The material collected is being used as a fill for a coffer dam on the west side of the dam proper. Above: General view of the quarry after sluicing operations started

The Type RF-6 TERROMETER

Patent Pending



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suit. On such a long journey it is of course impossible to rely on the usual oxygen supply which pilots use for altitude flights of comparatively short duration. Wiley Post has hit on an entirely new idea in this altitude suit of his, which is shortly to be tested in a practice flight.

The flying suit has been developed by the Goodrich Rubber Company, who are also responsible for the well known airplane "de-icers." We are indebted to the engineers of this company for a first hand description of the suit.

A dural helmet, similar to those used by divers, is attached to a rubberized silk fabric shirt. Gloves are continuous with the sleeves; pants of the same material are attached to rubber boots.

The helmet is made with a fixed glass visor, with a mouth door which can be opened at will, and which when closed is sealed with sponge rubber. At the top of the trousers is a metal ring to which the fabric is cemented so as to form a seal. The skirt of the shirt is sealed around the ring at the top of the trousers by means of a separate split ring.

The suit is inflated by a line from the engine supercharger. There is also a separate line carrying warm air, which is heated by passing through a copper coil wrapped around the exhaust stack. The flier can lead this hot air into his helmet and remove any frost which may collect at high altitude. Another connection of the hot-air line will provide warm air for the suit itself. The suit is designed so as to withstand a pressure differential of five pounds per square inch between the inside and the thin air of the outside atmosphere. The gloves at the ends of the sleeves are made of rubber and are tight fitting. Roughly, the principle of an inner tube casing has been followed in the design of the suit.

At the knees and elbows there is an elastic rubberized fabric material which fits snugly but affords freedom of limb movement.—A. K.

A Real Golf Practice Device

THE royal and ancient game of golf has been played for more than four centuries without a satisfactory practice device that enables John W. Duffer (or Mrs. Duffer and son John Jr.) to step up to a real

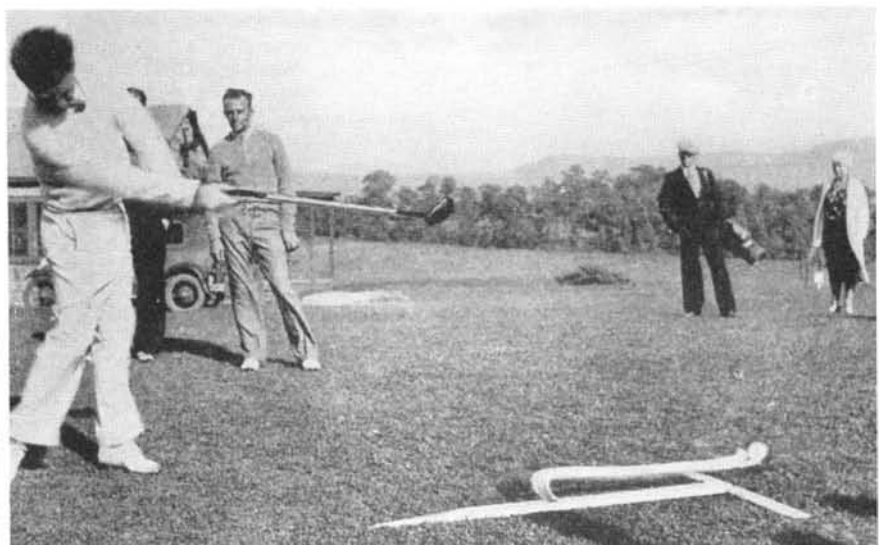
golf ball in the privacy of their own home, hit said golf ball as hard as possible with a real golf club, and obtain registration of slice, hook, distance, and direction in a few feet of space. True, many attempts have been made to provide the ideal device, using complicated electrical and mechanical systems.

It remained, however, for John K. Stafford, an engineer of the General Electric Company, to invent Golf Register, which will accomplish the desired results in a simple manner.

Golf Register consists essentially of a ball harnessed to a leather strap encased in a collapsed rubber tube. The tube in turn is held inside an aluminum trough. The aluminum trough is pivoted at one end and forms both a friction device against pulling out of the rubber tube, and a direction indicator. A vertical stud driven through the center of the golf ball serves to tee up the ball for a drive. When hit, the ball flies forward, but is brought to rest within 12 feet of forward travel.

Slice or hook is registered while the clubhead is in contact with the golf ball, by the proportionate rotation of the ball in a clockwise (slice) or counter clockwise (hook) direction on the vertical stud. This registration is then preserved by "friction lock" principle. This is obtained by an extremely simple mechanical construction that locks the ball against further rotation on the stud, as the ball shoots forward and beats down violently against the ground. This friction lock is accomplished by the mushroom shaped head of the stud G, shown vertically mounted through the ball in the accompanying cut. When the stud is in the position shown in the cut, the golf ball exerts practically no pressure against the mushroom shaped head of the stud. Hence, the ball can rotate clockwise (slice) or counter clockwise (hook) on stud G while the clubhead is in contact with the ball, and the proportionate rotation of the ball into the slice or hook area on top of stud head G, indicates the severity of the slice or hook. The ball is then locked in this position, and is held by friction against further rotation, as the ball shoots forward and beats down violently against the ground in coming to rest.

Carry distance (flight in air of free ball) is registered by the amount of collapsed



The golf practice device, described above, in use

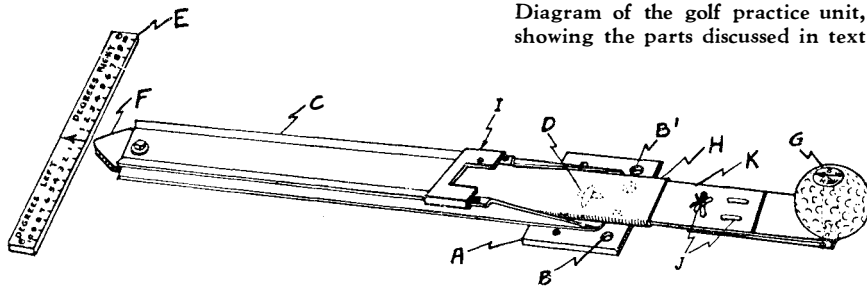


Diagram of the golf practice unit, showing the parts discussed in text

rubber tube H pulled out by the momentum of the ball straining forward against the backward drag of the rubber tube in the friction trough C. The inside bottom of the trough C is calibrated in multiples of fifty yards, to register the approximate distance that would have been obtained by a free ball. Direction of flight of ball as it leaves the tee is recorded simply by the "weather vane" action of the aluminum trough C which is so light in weight that it swings around to point toward direction of flight taken by ball.

Silica Black

SILICA black is the name given by C. A. Jacobson of West Virginia University to what seems to be a new chemical substance, developed by him. Silica black is made by mixing together finely divided coal and siliceous material such as diatomite. The mixture is heated in the absence of air to a temperature between 650 and 1100 degrees, Centigrade. The resulting powder is separated into three grades, the finest having a specific gravity of 0.25 and being composed of 18 percent carbon, 75.5 percent silica and 6.5 percent oxides, sulphides and silicides of iron, aluminum, and other metals.

Silica black has a high oil absorption, mixes well, and has good spreading quality; it therefore might be used as a pigment in paints, printing inks, and so on. It reduces metallic oxides at high temperatures. It adheres tenaciously to objects and might be used as a carrier for insecticides, wood graining, leather tinting, and so forth.—A. E. B.

Hazards in Economy

DON'T buy "gas savers," "grease absorbers," or "burner protectors." They don't save a penny; in fact, they usually cost more by increasing gas bills and many of them cause headaches, or worse effects of that stealthy and dangerous poison, carbon monoxide.

The National Bureau of Standards has conducted an investigation of a number of gadgets and appliances that were sold over the doorsill by salesmen who lauded them to the skies in extravagant claims of their value. The results of this research called for a warning against such purchases, which the Bureau issued.

All of the "gas savers," it stated, affected the operation of a satisfactory gas range in such a way as to increase the tendency to form carbon monoxide, which even in very small amounts is injurious to health. Although agents sometimes boasted of a reduction in gas bills as high as 30 percent, none of the attachments tested increased efficiency appreciably, while some of them considerably increased the amount of gas

needed for certain purposes.

The "burner protectors," the report continued, keep the burners clean but do so at the expense of cooking efficiency. None of the water backs tested proved satisfactory while some of them caused the formation of carbon monoxide. Attachable solid tops and all the varied things which are placed in the flues tended to prevent complete combustion and to lower efficiency and were an actual menace to health. A flue is constructed by the manufacturer to be as small as possible and still allow complete burning of the gas, and when it is obstructed further to keep more heat in the stove or for any other purpose, a dangerous condition frequently results.

"The 'grease absorbers,'" scientists observe, "should be called grease diffusers, because they merely distribute the grease more uniformly around the kitchen. Those that are filled with steel wool or other material in such a way as to obstruct the passage of the flue gases may become dangerous."—Science Service.

Honey for Golf Ball Centers

WITH a golf ball that is literally a "honey," golfers ought to be able to register some "sweet shots." Experiments have shown that honey possesses several of the chemical requirements that fit it for use as a golf-ball center. Many substances have been tried as centers for golf balls but the ideal material for the purpose has not yet been discovered.

According to Arthur M. Maas, in *Chemistry and You*, honey is hygroscopic, or has a natural affinity for water, and so will not dry out. It is not explosive—some golf ball centers have been. It is non-corrosive—a center filling that burns if the covering breaks is distinctly no nice.

Besides these requirements, golf-ball centers must have the following qualities:

High density—the weight per cubic inch must be high so the ball will not be affected by wind, and will hold a true course.

Elasticity—this makes it bounce from the club, and gives liveliness.

Small change in volume with changes of temperature—the ball should act in nearly the same way on hot and cold days, and heat should not burst it by expansion of the center material.

Uniform viscosity, or "gooiness," determines the spin of the ball on hot and cold days.—A. E. B.

No Man-Made Device Starts or Stops Rain

MANY suggestions for stopping the severe drought of 1934 have come in to the United States Weather Bureau during this summer, just as many are received for stopping floods in times of excessive

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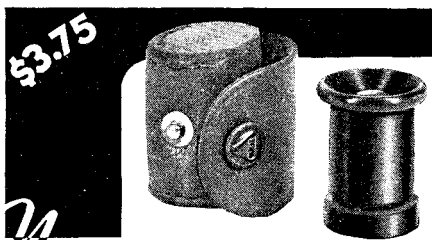
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rainfall. In fact, a single cause, the wide use of radio, is often advanced for both drought and flood. No device yet developed by man is of any practical value in starting or stopping rain, according to Dr. W. J. Humphreys of the Weather Bureau.

Nature's method of making rain, Dr. Humphreys explains, is first to get an abundance of water into the atmosphere by evaporation from water surfaces, ice surfaces, growing vegetation, and damp soil and then to squeeze it out by lowering the temperature.

Ordinarily there is enough moisture in the air to provide at least a moderate rainfall whenever Nature's machinery for its condensation into raindrops is working right. This machinery calls for the proper distribution and movement of air masses differing in temperature and density. In other words, when a normal movement of atmospheric "highs" and "lows" is interrupted and a relatively stagnant atmospheric condition is established and persists for a long time, drought develops, notwithstanding the fact that there may be enough moisture in the air to produce rain.

Electrical devices, sprinkling the clouds with dry ice, starting large fires, and setting off loud explosions, among the other rain-making schemes suggested, either do not work or cost too much for practical use.

All of the electrical schemes investigated by the Weather Bureau, Dr. Humphreys says, are utterly useless.

Sending cooling substances up into the clouds to cause rain, he adds, is about a century old. Even liquid air has been tried. This plan, however, is wrong in principle, and no rain has ever resulted from such practices.

The use of fire to produce rain was strongly advocated 80 or 90 years ago and this suggestion continues to bob up from time to time. This method, Dr. Humphreys says, is correct in principle, but the cost of a fire big enough to break a drought would be prohibitive.

Disposal of Distillery Waste a Problem

ALTHOUGH the sale of their product is legal, the distilleries are finding that the law of the land is directed against the disposition of their by-products. At one Illinois distillery, for instance, the Government refuses to permit the discharge of untreated waste into the nearby river, for the resulting stream pollution would be roughly equivalent to that from a city of a million inhabitants. Consequently, the distillery is installing industrial waste treatment devices, costing approximately 300,000 dollars. The expenditure is to be made for evaporators, additional dryers, and housing. The plant, with a rated capacity of 20,000 bushels per day, is to operate on half-capacity output schedule until the treatment plant is in operation.—A. E. B.

New Type Double-Glazed Window

A NEW type of double-glazed window, known as Thermopane, which substantially reduces heat loss through windows and prevents frosting in cold weather, is now being produced by The Thermopane Company, a subsidiary of Libbey-Owens-Ford Glass Company.

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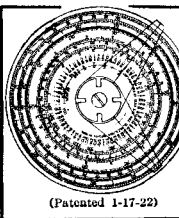
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Ninth International Photography Congress

THE first International Congress of Photography was held in Paris in 1889. Since that time meetings have been held at intervals of three to five years, excluding the four-year war period, in Liège, Brussels, London, and Dresden, in addition to Paris.

The next congress, the ninth, will be held again in Paris next year, 1935, from July 7 to July 13. The meetings will be held in the rooms of the Société Française de Photographie et de Cinématographie, 51 rue de Clichy, Paris (IX^e).

The Ninth Congress will be organized on lines similar to those of previous congresses. The active organization will be in the hands of a French committee consisting of representatives of many of the scientific, photographic, and allied societies of France, and headed by the French Photographic Society. The arrangements in other countries are made by the local National Committees. These committees have been established in many countries to deal with the proposals and recommendations of the congresses, to present material to the congresses for international consideration, to arrange for a series of first-class papers on appropriate photographic subjects to be submitted to the congresses, and so on.

The Secretary of the American Committee is Dr. Walter Clark, Research Laboratories, Eastman Kodak Company, Rochester, New York. There are two sub-committees in this country, dealing respectively with Sensitometric Standardization and Motion Picture Standards.

CURRENT BULLETIN BRIEFS

SCULPTURES BY HERBERT HASELTINE OF CHAMPION DOMESTIC ANIMALS OF GREAT BRITAIN, (Zoology Leaflet 13), provides an excellent representation not only of the particular champions which were used as models, but also of types illustrating physical characteristics of various outstanding breeds

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THE DESERTED VILLAGE (No. 4). Correspondence between Francis P. Garvan and Government officials regarding the development of the pulp-wood industry in the South. *Chemical Foundation, 654 Madison Ave., New York City, N. Y.—Gratis.*

101 USES FOR THE AIR-ACETYLENE FLAME. Every repair shop will welcome this handy reference guide which takes up a number of different fields in which the air-acetylene flame may be used, including plumbing and piping, air conditioning and refrigeration, marine work, automotive repair, power and electrical, and others. *Write for bulletin 10A to Scientific American, 24 West 40th Street, New York City.—Gratis.*

THE NEW PENN SYSTEM OF TEMPERATURE CONTROL. Prepared for distribution to members of the heating industry, this 28-page illustrated bulletin covers as briefly as possible the advantages and elementary features of a new concept in room temperature control. *Penn Electric Switch Co., 2000 East Walnut Street, Des Moines, Iowa.—Gratis.*

BIBLIOGRAPHY OF INFORMATION ON AIR CONDITIONING (No. 1383). This is the third edition of an interesting pamphlet devoted to trade associations, institutes, and societies interested in air-conditioning. The references to periodical literature are several hundred in number. *Bureau of Foreign and Domestic Commerce, United States Department of Commerce, Washington, D. C.—Gratis.*

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on such subjects as "Motor Omnibuses a Century Ago," "The Evolution of Early American Bridges," and a dozen others. The Society was founded in 1920 and has an American branch with about 40 members. *A. Stowens, Hon. Treasurer, Science Museum, S. Kensington, London S. W. 7, England.—20 shillings.*

STRIKES, BUSINESS, AND MONEY

(Continued from page 179)

accord, would be slow and uncertain. The only sure and immediate way to full price-level restoration is an adequate adjustment of our gold *price*. This merely offsets the increased purchasing power of the commodity gold. *It is not inflation.* It is the surest way to avoid the printing press—which every sensible American knows can be more deadly than the machine gun.

How long will the capital goods industries stand by, losing profits for their stockholders, with billions of farmers' buying power destroyed—and much greater totals for other producers—because of blind adherence to an unchangeable quantity of gold?

Leaders of the national farm organizations see this. That is why they appealed recently to the Committee for the Nation to enlist support of the business world to induce the President to raise the price of gold at once to the limit authorized by Congress, and to work with agriculture for enactment by Congress of permanent monetary legislation to insure a dollar in the future more stable than the wildly fluctuating gold dollar which has nearly wrecked civilization.

I hear an outcry to this. "War, not money, wrecks civilization." But please remember that economic distress, due almost invariably to disastrous changes in the value of money, is usually the moving force behind revolution. Deflation is the handmaiden of dictators, be they Fascist or proletarian.

Marx and Engels, fathers of the Communist philosophy, knew this 85 years ago when Engels wrote to Marx that he hoped the flood of new gold from Australia and California would not end deflation, and Marx wrote Engels that he feared it meant postponing their dream of a Communist state for at least two generations.

Organized agriculture, with its strong political influence, invites industry to mobilize in support of immediate measures to restore our price level. This is the only way to cut the ground from under Communist efforts to overthrow our social order.

Remember that the sparsely settled agricultural states have the preponderant vote in the U. S. Senate. Remember that the *kulaks* (independent farmers) resisted Russian communism long after city opposition had been suppressed. Remember that Theodore Roosevelt foresaw the wave of communistic influence and said the way to resist it in America was to make our farmers the bulwark of private property.

Can we awake industry to realize that it must act to save itself—to keep out European ideas, and preserve our American system?



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COMMERCIAL PROPERTY NEWS

Conducted by SYLVESTER J. LIDDY

Chicken Capsules in Patent Suit

TO administer medicinal capsules or pills having insoluble coatings to human beings would be about as efficacious as feeding them so many pebbles or stones. However, a capsule or pill containing a vermifuge and having an insoluble coating is a most effective instrument for treating fowl for worms in the intestines and so the Circuit Court of Appeals for the Third Circuit held in the recent case of *Geo. H. Lee Company v. Pratt Food Company*.

The suit was brought by Geo. H. Lee Company, on Patent No. 1,778,264, and charged that the Pratt Food Company, by manufacturing and selling a capsule or tablet with an insoluble coating for treating chickens and other fowl suffering from intestinal worms, had infringed the patent. The Court found that prior to the invention of the capsule disclosed in the patent in suit various attempts had been made to treat fowls for worms in the intestines, all of which were more or less unsuccessful. The worm medicine had been mixed in troughs with chicken food but the healthy chickens which had no worms consumed the major portion of the food and got most of the worm medicine, while the unhealthy chickens which had worms got little or no food or medicine. Furthermore, it was found that the medicine was diluted or absorbed in the alimentary canal before it reached the intestines where the worms are lodged. Another attempt had been made to administer the vermifuge by means of a catheter, but after trial that method was found ineffective for various reasons.

The patentee overcame the prior difficulties by the simple expedient of incorporating the vermifuge in a tablet or capsule having a coating unaffected by body heat and insoluble in body fluids but frangible so that it could be broken by mechanical action in the gizzard. The gizzard is located immediately in advance of the intestines and the medicament is therefore disgorged full strength into the intestines where it effectively eliminates the worms.

After considering the evidence, the Circuit Court of Appeals stated:

"The proofs show that a capsule of such functional capacity was new in the art. It was useful, as is shown by its rapid, extensive and growing use."

The Court found the patent valid and infringed and awarded an injunction and accounting to the Geo. H. Lee Company.

Position of Trade Mark

IN *ex parte* Eastman Kodak Company, First Assistant Commissioner Spencer held that the company, of Rochester, New York, is not entitled to register, under the Act of 1905, the notation "Twindar" as a trade mark for photographic lenses because there is not shown to have been any trade

mark use of that notation on the goods specified.

In his decision, after stating that a part of an article can be trade marked if it is separately marked and that it appears that a trade mark for the lens could be readily placed upon the lens mount, the First Assistant Commissioner said:

"The appearance upon the body of the Kodak of the words 'Twindar Lens' does not amount to trade mark use of the notation; on the contrary, the words are employed purely in their descriptive or explanatory sense to indicate to a prospective purchaser the fact that the Kodak is equipped with a lens of that particular name or trade mark. When employed in this explanatory fashion, it fails to indicate the origin of manufacture and therefore fails to carry a trade-mark significance."

False Statements About Aluminum

STATEMENTS to the effect that the use of aluminum cooking utensils causes cancer or other grave maladies or of the increase of such disorders among the users of such utensils, will be discontinued by an individual engaged in the sale and distribution of cooking ware, as a result of a stipulation of the Federal Trade Commission. Several other representations will be abandoned by this individual, including one to the effect that thousands of people are dying every day from cancer because of their use of aluminum cooking utensils and one to the effect that doctors and hospitals are now advising people against the use of aluminum utensils because of poisonous effects.

Correspondence School Misrepresentations

HOLDING out of false prospects to prospective students is charged in a formal complaint issued by the Federal Trade Commission against Lincoln Extension University, Inc., of Cleveland, Ohio.

Misrepresentation of earnings possible to be attained by pupils who take the course is charged in the complaint. The respondent advertised that knowledge and power to be derived from this course "should certainly add at least an average of 100 dollars a month to your earnings for the rest of your working life." It was said also that "in only twenty years this will amount to 24,000 dollars, which you would not have earned without the training service."

The respondent is charged with misrepresenting to prospective pupils that their names had been submitted by the management of a factory or other place of employment, thus causing the pupil to believe that if he were to purchase the required books and take the course, his prospects for employment or promotion would be bettered.

"An ordinary common school education is absolutely all one needs to tackle this training service," the school asserted in advertising to prospective students, "but at the end of it (the training service), a Lincoln man can rub shoulders with college graduates and be accepted as one of them."

The respondent, according to the complaint, is not the equivalent of a university nor do the books and pamphlets comprise an extension of any university.

Untruthful Patent Statements Curbed

THE Chaney Manufacturing Company, Springfield, Ohio, manufacturing barometers and thermometers, agrees, as a result of action taken by the Federal Trade Commission, to cease stating directly or indirectly in advertising matter or otherwise that it owns United States or other patents on a combination containing a thermometer and barometer or on either the thermometer or barometer. The company also agrees to cease using the words "we own all patents on same" and "patented by" or words of equivalent meaning in a manner to deceive purchasers into believing the corporation has exclusive right to make, use and sell these products or that it owns active patents on them when this is not true.

Monopoly Charge is Not a Patent Suit Defense

IN Federal Court recently Judge Philip Forman struck from an answer to patent infringement suits charges that the Radio Corporation of America and the General Electric Company had an "illegal monopoly" of radio patents.


The Hygrade Sylvania Company, of Massachusetts, as a defense to suits by the two companies charging that it infringed radio tube patents, had replied that the companies violated anti-trust laws.

The court said it was a "well settled question" that in a patent suit charges that the plaintiff is party to an unlawful combination do not constitute a defense.

The Hygrade company had charged that it made every effort to obtain licensing agreements on reasonable terms but had been refused solely because of the "illegal agreement" to restrict licenses.

"The fact is," the court said, "that the government approved the agreement as lawful and consented to its execution. . . . The patents are the Radio Corporation of America's and the General Electric's property, and that being the fact, they may refuse to license or license as they choose. The owner of a patent has a limited monopoly. Whether the refusal to license is based on a commendable or odious reason is immaterial. The law allows the inventor absolute property in his invention."

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