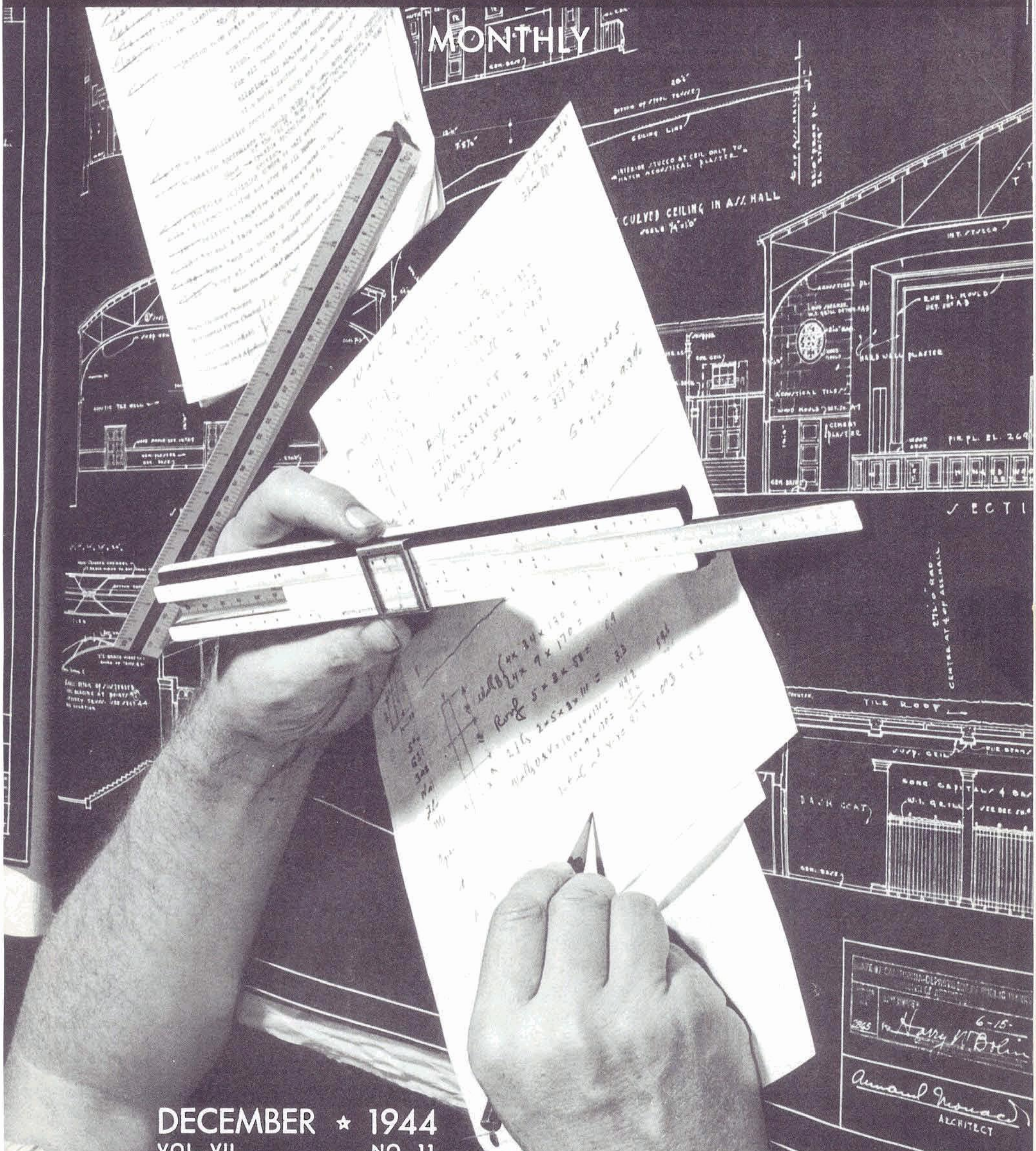
ENGINEERING AND SCIENCE

MONTHLY



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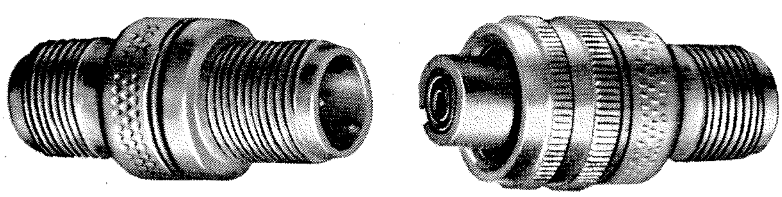

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ENGINEERING AND SCIENCE

Monthly

The Truth Shall Make You Free

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ENGINEERING AND SCIENCE MONTHLY

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ENGINEERING AND SCIENCE
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"The Old Order Changeth . . ."

By WILLIAM B. MUNRO*

SINCE the beginning of the Christian era there have been 65 generations of men. But in looking back over this long stretch of nearly two thousand years it is significant that there have been very few generations in which it could have been really thrilling to live. As for the rest, men were born, lived and died in a world which remained substantially unaltered during the course of their pilgrimages from the cradle to the grave.

Now whatever else may be said about the generation in which you and I are living, one thing can at least be looked upon as certain. This first half of the twentieth century will go down in history as perhaps the most astounding interlude in the entire annals of mankind. Yet those of us who are living through it, I am afraid, have only the most elementary appreciation of its far-reaching significance. The vast majority of our people have not yet sensed the immensity of the changes which are taking place immediately around us, changes not only in what we call the American mode of life but in our traditional philosophy of government, in our relations with the rest of the world—indeed, in our whole orientation of thought.

This vast transformation in our social outlook is not the handiwork of one administration, or one political party, or one group of leaders. It is not attributable to any single cause. It amounts to a social revolution, and revolutions are not made by anyone; they come. They come in the sequence of events; they are inspired by causes which lie far below the surface, and they are rarely recognized as revolutions until after they have run their course.

In this connection one of the rarest among human qualities is the virtue of hindsight. People speak of foresight as a great and rare virtue; but hindsight is an even greater and rarer one. It is surprising, when you come to think of it, how few among us realize that the future is merely the prolongation of the past, and that the law of continuity is the most fundamental of all the laws which govern the evolution of the social order. We build things that are new on things that are old; hardly ever do we abolish any established social, political or economic institution. What we do is to alter it by successive steps until the whole character of the institution is changed, and these changes are sometimes wrought so insidiously that their significance is not fully recognized until after the process has been completed. That is where the danger lies in all eras of transition; we lose sight of the landmarks from which we started and are carried farther than we intended to go. Looking back over the happenings of the past dozen years one feels as though he were sitting on the rear platform of a train gazing wistfully at a rapidly receding landscape. And no matter how much we may regret it, this receding view is one that we will never see again, at any rate, never in the same perspective.

CHANGES IN THE POLITICAL SCENE

Not long ago I was asked to indicate what, as a student of government, I regarded as the most important changes in the American political scene during the interval that has elapsed since the turn of the twentieth century. The answer, as you may well imagine, is not an easy one to make. But if I were compelled to answer I would say that the most fundamentally significant of all the changes which have taken place during these four decades are those which concern, *first*, the relationship of the American federal government to the states of the Union, and *second*, those which concern our relations with the rest of the world.

For more than a hundred years after the establishment of the nation this relationship underwent no substantial change. It remained, in general, as it had been set up by the founders of the Republic. The federal government took care of the national defense, conducted our relations with foreign countries, and regulated commerce among the several states. These were its principal functions. Most other matters were left to the states, as the Constitution intended them to be. The states regulated trade and industry within their own borders; they were left free to manage their own educational systems; they supervised their own banks, public utilities and insurance companies; they were responsible for the protection of the lives, liberties and property of their own people. For well over a century the two branches of government, national and state, worked with reasonable harmony within their own orbits, each with due respect for the rights and functions of the other. It is true, no doubt, that this balanced adjustment of responsibility, which is the essence of federalism, did not always operate smoothly; it creaked rather badly at

*Commencement Address, California Institute of Technology, October 30, 1944.

times and in spots; nevertheless it did provide an arrangement under which the work of governing a rapidly expanding society was successfully carried on.

But in our time we have seen a radical departure from this traditional philosophy of governmental responsibility. Step by step the national government has been reaching into fields of jurisdiction which the states have hitherto regarded as their own, driving a wedge here and there, until the old apportionment of powers has been seriously thrown out of balance. The dislocation is far more extensive than is generally realized. Nor does this great expansion of federal powers appear to be a temporary affair, dictated by national emergencies. It has the earmarks of a planned invasion, designed to be permanent. Its apologists have been at no pains to conceal their underlying purpose, which is to concentrate in the national government the ultimate power over all industry and labor (whether directly engaged in interstate commerce or not), and in large measure over agriculture as well. It aims to supersede, by federal control, the jurisdiction which the states have always exercised over the enterprises of their own people and over their own natural resources. It has already succeeded in centralizing at Washington a virtually complete mastery over the entire banking and credit facilities of the country. By the device of grants-in-aid, or subsidies for public works as well as for all manner of social welfare projects, the federal authorities have been quietly insinuating their way into an illegitimate mastery over the individual commonwealths.

EXPANSION OF FEDERAL POWER

Some expansion of federal power has doubtless been justified by the necessity of dealing with great and difficult economic problems on a national scale; but no one should disguise from himself the fact that, whatever its justification, this steady absorption of state functions by a centralized bureaucracy is inexorably reducing the individual states to a secondary place in the frame of government. And to the extent that this is being done the foundation of American government is being changed. Perhaps it is time for a change; perhaps there is no escape from it; but at least we should realize what we are doing while we are doing it.

The division of this country into 48 states is not a mere geographical accident. It is not merely the product of historical circumstances. On the contrary, it is the exemplification of a sound principle, namely, that in a country so vast and varied as the United States there must be a division of governmental functions between central and local authorities, otherwise the whole edifice will sooner or later break down by reason of its sheer top-heaviness. If there is any one thing that has been a success in the American practice of government during the past 150 years it is the success with which so large a part of it has been kept close to the homes of the people. It has been government not merely by those who pay the bills but by those who know that they are paying the bills. To the extent that we remove government farther away from the homes of the people there will be a loss not only in its representative character but in the adaptability of public administration to local needs and conditions.

North Dakota and Mississippi, Rhode Island and California are under the same flag, but this does not mean that they should be forced to have their widely-varying problems handled in precisely the same way. The theory of federal centralization assumes a uniformity of American life which does not in fact exist. Our strength as a nation arises from diversity as well as from unity. It assumes that the principal concern of a government is with economic affairs, forgetting that the citizen is a man and not merely a worker. Political philosophy should take in a much wider sweep than political economy. Any centralized pressure that tends to force all the 48 commonwealths into a common mold is bound to impair their individuality, and in the long run what weakens the states will weaken the nation.

There can be no permanent autocracy in America so long as the states are vigilantly protected in their fundamental integrity; on the other hand we should bear in mind that in all the countries where free government has perished the first step towards dictatorship has involved the extinction of local autonomy. We may seem to be far from any such danger in the United States, but the whole history of nations has shown that the deprivation of popular liberties invariably begins with measures which are loudly proclaimed to be for the protection of the people. We are a people with the instincts of political caution and I haven't the slightest doubt that if any open attempt were made to convert the 48 states into mere provinces of the nation there would be a surge of protest all over the country from Portland, Oregon, to Portland, Maine. But when the same thing is being attempted by what one of my colleagues has called "the artichoke method," that is, by pulling off a leaf at a time, there seems to be very little resentment at all.

AMERICA'S OBLIGATION FOR WORLD PEACE

But the most momentous task which will face the United States of America during the next few years is not concerned with our internal problems, great and difficult though some of these may seem to be. I do not think it an exaggeration to say that in determining what kind of world we are going to have tomorrow, and the day after tomorrow, the present generation of Americans has in its hands the most extraordinary opportunity ever presented to any nation at any time. This is because the United States has today achieved a position where we can, if our people are willing, play a decisive part in charting the course of world peace and progress for generations yet to come. We can assume the obligation to help guide international relationships in a way that will help to prevent future wars, or we can abdicate this high privilege and let the future gravitate into its own course, which is what happened after the last great conflict, with tragic consequences to everybody, including ourselves. Between these two alternatives no thoughtful citizen should have much hesitation in making a choice.

And of course there is no substantial disagreement among the people of this country on the general proposition that there ought to be a world organization for the preservation of peace and that the United States should be a part of it. Indeed it is in that simplification of the problem that much of our trouble begins. Everybody desires peace, but not everybody is ready to approve the sacrifices which the effective maintenance of peace must inevitably entail. Yet if we desire the end we must tolerate the means which are essential to the attainment of the end. That ought to be a self-evident proposition, although not all our political leaders seem to realize it. No country has a greater interest in the preservation of peace than we have. The greatest of all our national interests is peace. Surely the protection of this national interest is worth any reasonable price that we may be asked to pay for it—even though the price involves both future commitments and potential restraints upon our own freedom of action. If ever there was a problem which calls for largeness of mind and a willingness to

(Continued on Page 14)

The Science of Trout Fishing

By WILLIAM W. MICHAEL

IN writing an article on the science and the sport of trout fishing one hesitates between adhering strictly to the technical aspects and leaning toward the popular. It is difficult to know at just what point to begin—whether to assume that the reader has, so to speak, passed through elementary school, high school, and college and is ready to enter upon a graduate course, or to begin at the very beginning. It is the opinion of the writer that the latter approach may be in order, at least to cover the fundamentals for those who are beginners. The experts may, as they please, omit the portions with which they are already familiar.

In this discussion the writer hopes to bring out six main topics, namely: mechanics, entomology, hydraulics, optics, chemistry, and meteorology; and to show their application to fly fishing, with the emphasis on the floating or dry fly. This, in the mind of the reader, will bring up the question, why fly fishing? It should be understood that the writer has no quarrel with the bait fisherman, he himself having passed through this stage some 40 years ago as a boy. In fact, he learned much about the habits of trout in those days of bait fishing. It is his opinion, however, that fly fishing has possibilities in the way of true sport that the use of bait does not offer.

FLIES VS. BAIT

In these days of heavily fished streams, which are likely to be the only ones readily accessible, some means of assuring the continuance of the sport must be found. It would seem fair to limit certain streams to fly fishing as well as to limit others to bait fishing for those who for whatever reason cannot change their methods. Some of the Eastern states have done this with excellent results. In the Kennebago Stream in Maine, where fish up to three or four pounds are not uncommon, a fisherman is allowed to kill only one trout a day; all others must be returned to the stream unharmed. Naturally this restriction precludes the use of bait. One can enjoy excellent fishing on this water, and in using a fly he can release the fish without doing them any permanent injury. The Deerfield River in western Massachusetts has, or did have only a few years ago, a limit of three trout killed, none under 16 inches in length to be kept. That portion of the stream restricted to these conditions naturally necessitated the exclusive use of a fly. Pennsylvania has set aside one stream where only women and children are permitted to fish. It is the writer's understanding that this stream is not necessarily restricted to fly fishing, but carries a limitation of the number of times per season that any one person may fish it.

The legal limit of 25 fish in California could easily be reduced to 10 or 15 at the most. Montana and Idaho have prohibited the use of salmon eggs, not that a single salmon egg is so deadly, but when this bait is used, literally by the case, for chumming, as is done on some of the High Sierra lakes of California, the sport of trout fishing loses its appeal.

To those of us who have been converted to the use of flies, the all-absorbing fascination of the sport, the skill developed, and the fact that there is always something new to be learned, regardless of the years we have spent learning the art, have their distinct appeals, and we know that no other form of fishing can quite equal this. If we find that a trout will not rise to a Royal Coachman, we still have unlimited other patterns that may lure him to the surface. We can cover more water in the same length of time by the use of the fly than is possible with the use of bait.

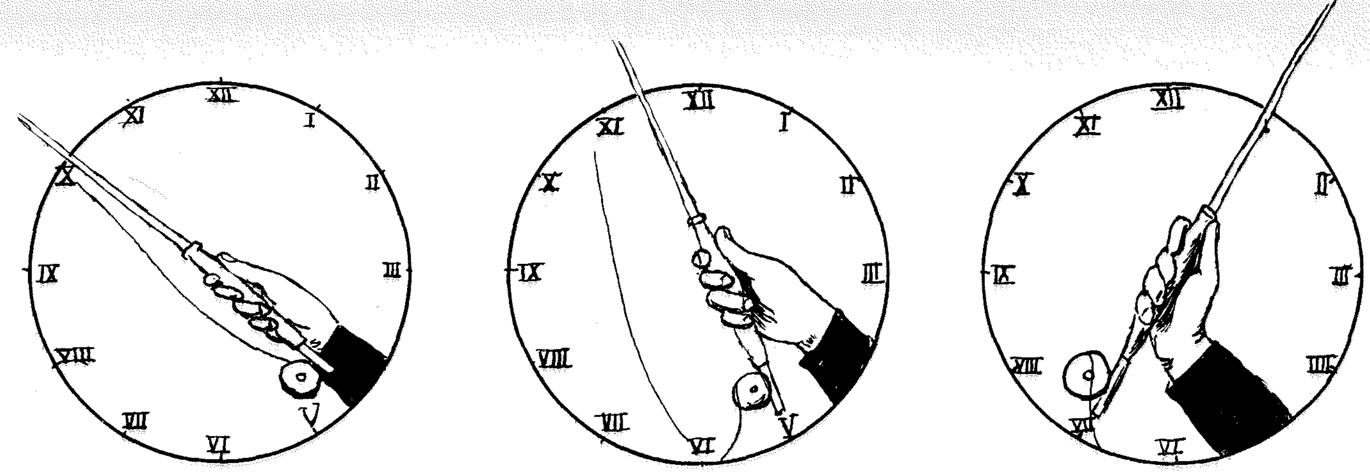
The writer often has asked some of his friends who are content with using bait, "Why not try a fly?" The answer has invariably been that they catch enough fish with bait; so why try flies? This is an admission that they are more or less satisfied individuals who do not appreciate the fact that in any form of sport there is always an opportunity to learn something new. It is not difficult to learn to cast a fly. An hour or less with a good fly fisherman, and anyone can master the fundamentals. After that it is purely a matter of practice to develop sufficient skill to handle the equipment.

A false opinion exists in the minds of many that the fly fisherman considers himself a superior individual. Such is not the case. We merely entertain the opinion that we are enjoying our sport to the utmost. Often too, the bait fisherman feels that the equipment necessary for fly fishing is too expensive. The writer started off with an outfit that cost not more than seven dollars. With this equipment he learned the fundamentals and fished for several years with considerable success. True, one may spend almost any amount of money, but this is not necessary to full enjoyment of the sport.

EQUIPMENT: THE ROD

In regard to the equipment, the following items are absolutely essential and fundamental: a rod, a reel, a line, a leader, and a fly. True, this is just a beginning. One acquires suitable clothing and accessories. The dry fly purist on approaching the stream is sometimes bedecked like a Christmas tree with all types of gadgets, many of which are useful but not always necessary. It might be mentioned that the fisherman should carry a landing net, dry fly oil, a stream thermometer, scissors, amadou (an absorbent material for drying his fly), various fly and leader boxes, sun glasses, and, of course, a rain coat and hat in regions where rain is a possibility.

Of all the equipment, the rod is the most important. The truly good rod is the most difficult thing for the amateur to select. Too often the salesman is not an experienced fisherman, although his intentions may be of the best, with the result that the novice finds after several trips to his favorite trout stream that the rod does not function properly. No material has yet been found that will equal bamboo. Lance wood and green heart have been tried, but although they have their place, they cannot equal the bamboo. Steel also has been tried, but has never proved to be the equal. The best cane for rods was obtained before the war from the province of Tonkin in China. It was seasoned for several years before it was fit for use. The best cane came from hillside regions that were subjected to strong winds, which developed the resilience in the fibers so necessary for casting. When one considers that in using a dry fly he may make from five hundred to a thousand casts in a day's fishing, it can readily be understood that very few woods have the property of standing up under such a terrific strain. Nor does this take into account the strain on a four-ounce rod in landing a large trout in swift water. The bamboo is split into sections of equilateral triangular shape so that six of these may be glued together to form one section of a hexagonal cross-section. These individual sections are tapered to fit the require-



(a) (b) (c)

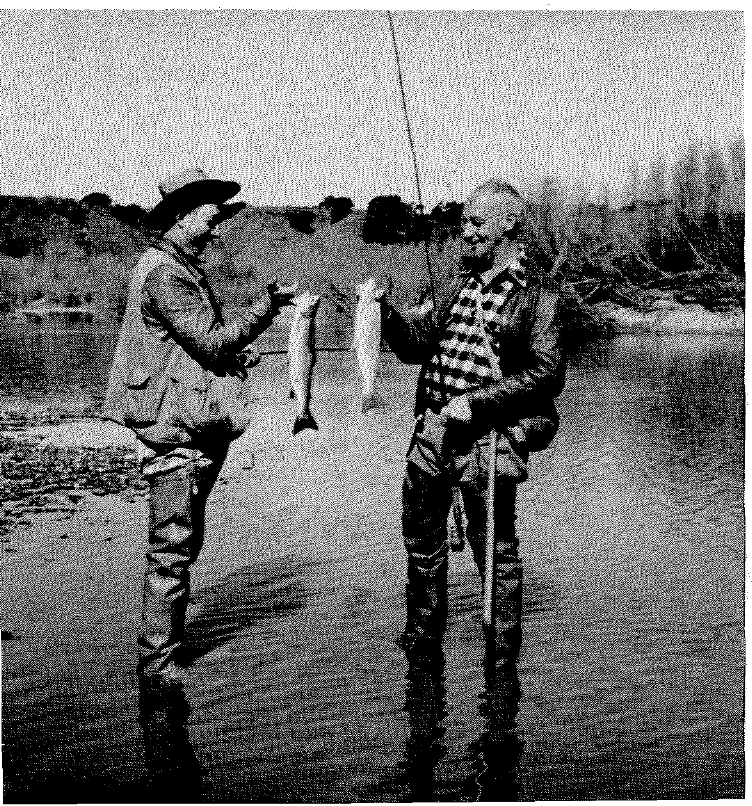
FIG. 1: Casting.

ments of the finished rod so that the completed product may have a uniform taper from the butt to the tip. The taper is accomplished on only two sides of the individual pieces, so that the natural enamel of the bamboo is not disturbed.

For dry-fly fishing it is recommended that a rod not to exceed four ounces in weight be selected. Certainly the lower limit for practical purposes should not be under two ounces, and even this light weight in the hands of anyone but an expert would not be desirable.

In recent years the two-piece rod has met with favor as against the older three-piece. One experiences enough difficulty with ferrules so that the elimination of one set is a distinct advantage, to say nothing of increasing the action of the rod. It is imaginable that a one-piece affair might be the most desirable, but transportation of a slender eight-foot delicate bamboo wand would present an extremely difficult problem.

Before the war an excellent rod could be bought for 15 dollars, or, if one so desired, he could spend up to 60 dollars. It is the writer's opinion that if he were blindfolded and a half dozen rods, made by the same rodmaker, and ranging in price between these two limits, were placed on a table before him, he would be unable, by the feel of them, to determine which was the most expensive. The only difference is that if a person fishes over a period of years, in the long run the more expensive rod will be the best investment. The materials of the expensive rod are much more highly selected, the fittings are better, and it will stand up under the punishment of a lifetime.



It is most difficult to describe that intangible something about a high-class rod that one instinctively knows is there when he starts using it. This is the quality that comes only by experience. One thing to avoid is too whippy or limber a rod. The initiated like to use the term "backbone," which is a most desirable feature.

REEL, LINE, AND LEADER

The reel which is preferred by most dry-fly fishermen is of the single-action type. The automatic reel, particularly among the Eastern fishermen, is not indicated for dry-fly work. The reel should weigh at least as much as the rod; preferably approximately one and a half times as much. It should have a permanent click so that it cannot be thrown off accidentally when most needed. Some authorities favor a left-hand reel so that the right-handed person may always maintain a firm grip on the rod and do the necessary work with the reel with the left hand. If one is fortunate enough to be playing a large fish, and has to transfer the rod from the right to the left hand, it may be at that exact minute that the trout will make up his mind to go places and the fisherman will find that he has no business transferring the rod from one hand to the other. For this reason, the left-hand reel is sometimes preferred. An agate line guide is a desirable feature; it is well worth the slight additional cost.

A tapered line is practically essential. A line of the soft finished or vacuum-processed type, 30 yards in length, is standard. Without going into details as to diameter, size, length of taper, and finishing processes, it may be said that the one essential is to have the line fit the rod. Too heavy a line will "kill" the action of any fly rod. Too light a line will not develop sufficient action for ease in casting. The tendency is usually toward too light a line for a particular rod. A favorable comparison would be that of attaching a string to a broomstick and trying to develop a springlike action in the stick. Many of the rodmakers attach to the rod a tag upon which is printed the size of line best suited to this particular rod. However, there is nothing like a trial to convince one of the best weight of line.

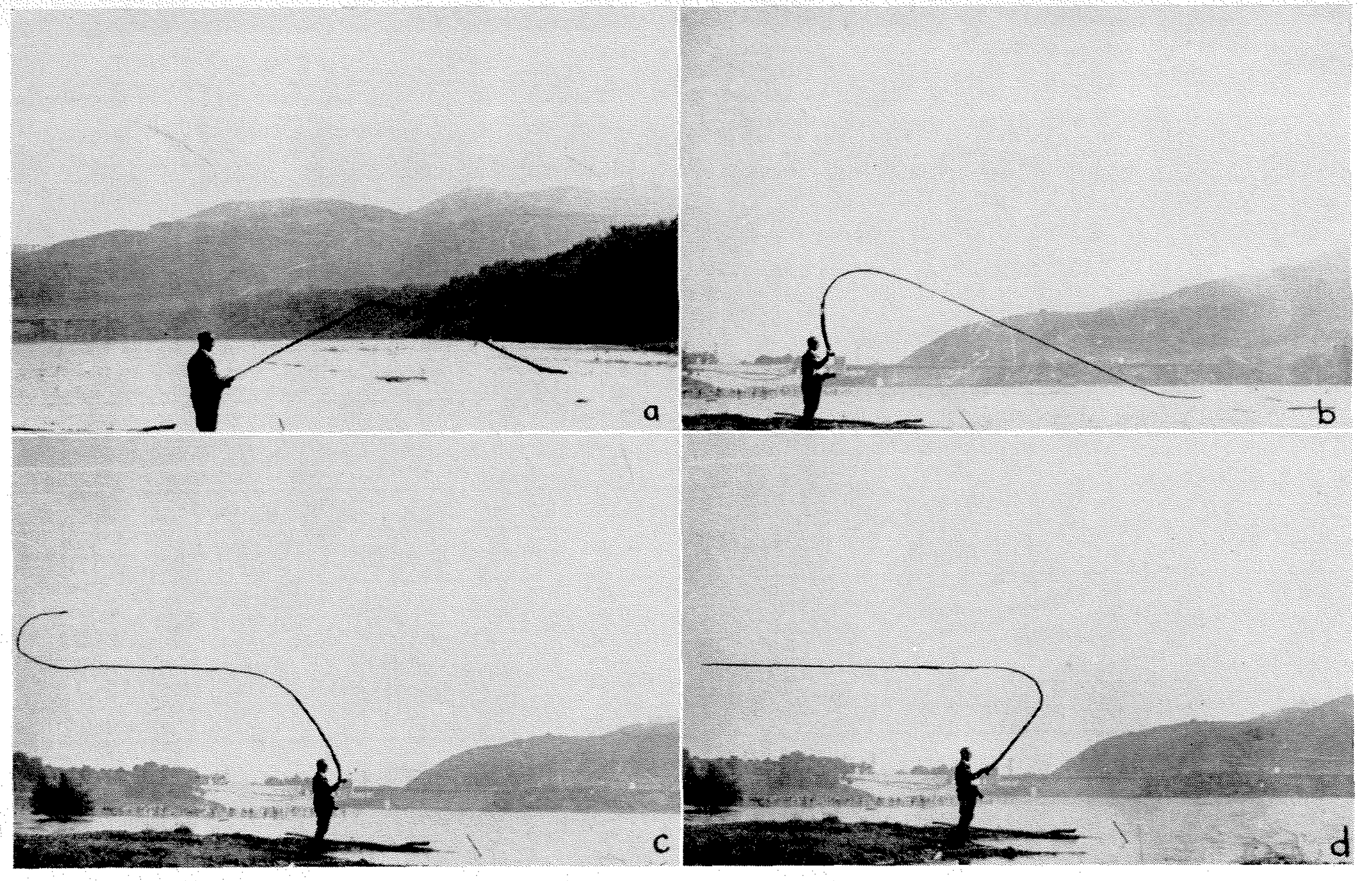


FIG. 2: Positions of line in fly-casting.

The next item to receive consideration is the leader, which is the connecting link between the end of the line and the fly. The materials from which leaders are made are of two types: one nylon and the other silkworm gut. Actually the silkworm material is nothing more or less than the unspun silk of the silkworm. The contents of the sack containing the unspun silk are stretched by hand and allowed to dry. As finer sizes than this method produces are needed they are drawn through dies until the correct size is obtained. The size of this drawn gut is indicated by numbers 1X, 2X, 3X, 4X, the larger size having the smaller number, the smaller size the larger number. The nylon is a comparatively recent development and has certain advantages over the natural, one being that it has a higher tensile strength for the same diameter. A leader is tapered from a large to a small diameter and may be anywhere from seven feet to 12 feet in length. In order to accomplish this taper it is necessary to tie strands of diminishing sizes together, each strand being approximately 16 to 24 inches in length.

A leader tapered to 4X in nylon will have a breaking tensile strength of one and a quarter pounds. In low clear water it is necessary that we use the terminal end of the leader of the finest possible size so that the fish can have no perception of anything attached to the floating fly. It should be mentioned here that in dry-fly fishing the leader should in all cases be submerged and not permitted to float on the surface. The silkworm leader must always be soaked between moist pads before it is used on the stream. This preparation is not necessary with nylon, although, in the writer's opinion, it is a help to keep it moist up to the time it is used.

At present none of the equipment mentioned is obtainable, because of the restrictions on manufacture by the war. Occasionally one finds a few items in some obscure sportsmen's store. Anyone who owns a good fly rod at this time should treasure it most highly. Even if the makers are again permitted to start their manufacture, it will undoubtedly be several years after the war before any rods are available, unless a stock of bamboo has been held over from pre-war days. Since most of our bamboo comes from China, the probabilities of an early shipment are very remote.

FLIES AND CASTING

It is with fear and trembling that the writer approaches the subject of flies. There are so many opinions as to size, color, and pattern that to mention any particular type as better than another would be arbitrary. One of the things that make fly fishing so intriguing is the fact that possibly the fly which would today fill a creel may not even raise a trout tomorrow. For a beginner one of the easiest dry flies to use is what is known as a bivisible. It has the ability to float well and is readily visible to the fisherman. More on flies will be covered after we have taken up the topic of entomology.

The mechanics of fly casting are relatively simple. A rod acts as a lever to pick up the line from the water. With the advantage of its resilience it throws the line into the air behind the fisherman so that he is really casting the line and the fly rides along with it. The simplest manner of showing the fundamentals of fly casting would be to refer to *Fig.* 1. Imagine the fisherman standing against a wall where there are three clocks behind him. He starts with the line on the water and the rod held as in (*a*) at 10 o'clock. The line is picked up and thrown into the air as shown at (*b*) with the rod in the position between 11 and 12 o'clock. The rod is carried through to approximately 1 o'clock as at (*c*). A definite pause is made here so that the line will straighten out behind the fly caster. Just as soon as this is accomplished, power is applied for the forward cast,

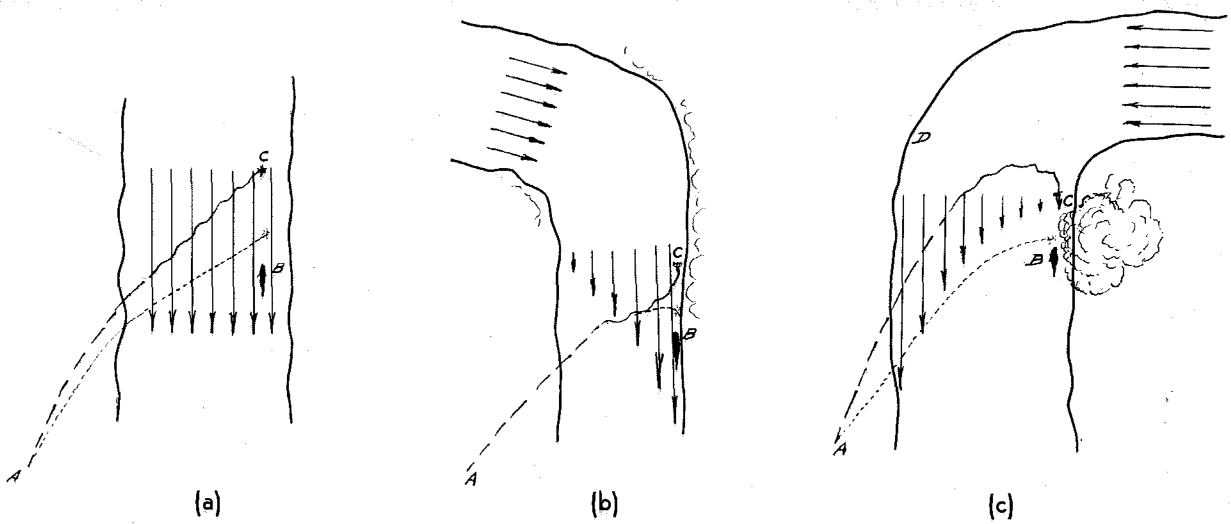


FIG. 3: Drag. Length of arrows indicates relative velocities. Solid lines indicate only that portion of leader and line in contact with the water.

the rod then being carried through to the 10 o'clock position, where the motion is checked. The line follows along and straightens out in front of the caster. Checking the rod at the 10 o'clock position permits the fly to drop lightly on the water. If a distinct pause is not made at the 1 o'clock position, and the forward cast is started too soon, it is like cracking a whip and the fly is popped off. This is one of the common faults of the beginner. Should he pause too long, then the line drops to the ground behind the caster, the fly undoubtedly gets caught on the brush, and there are the same results as though he had started too soon. In the retouched photographs, *Fig.* 2 (*a*) shows the position as the line is being taken from the water. In (*b*) the rod is curved, acting as a spring. In (*c*) the back cast has been checked and the line is straightening out to the rear of the caster. At (*d*) the caster is starting the forward cast, which will be carried through to the position shown in (*a*).

One suggestion may be of help to the beginner. In aiming a fly at a particular spot on the water, it is better to aim at a point two or three feet above, as this will permit the fly to float down of its own weight and alight with much more delicacy than can be obtained by aiming at the exact point on the water. The line should be taken up off the water quite vigorously in starting a cast, and if the caster will aim for an imaginary point directly over his head, this will be of considerable assistance.

After a few trials one becomes conscious of a certain rhythm to the whole procedure. The finished fly caster is never conscious of how long to pause for the line to straighten out, and rarely gives thought to catching anything on the back cast in the way of a tree or brush. He seems to know instinctively just what is happening behind him, whether he sees it or not.

ENTOMOLOGY

The entomology of the subject is fascinating. One who has never had the cycle of life of the common stream insect brought to his attention has missed one of the most interesting things in trout fishing. Briefly, it is about as follows: In its initial state an insect is a larva. Grubs and caterpillars, for instances, are larvae. From the larva stage the insect passes into the pupa, and last to the imago or fully developed insect. A pupa may be likened to the caterpillar and the imago to the butterfly. In so far as it affects the trout fisherman, the metamorphosis is as follows: The female fly deposits its egg on or in the water of the stream; in turn the egg sinks to the bottom, and hatches into the larva, which in the pupa stage, may or may not incase itself in a covering attached to a stone, log, or twig on the stream bottom. In the course of time, anywhere from one to three years, certain physical changes are taking place, until finally the insect is ready to dispense with its covering and rises to the surface and takes to the air. The imitation of this rising nymph from the stream bottom is the common artificial wet fly.

After the natural nymph reaches the surface its wings unfold and it flies away, a fully developed insect. Before flying from the water it often rides along on the surface while the wings are drying and developing. It is at this stage that the trout fisherman imitates the natural with his floating dry fly. This word "imitates" sounds exceedingly simple, but so many things actually come into account that effective imitation is the most difficult thing the dry fly fisherman has to contend with. Many factors are involved, such as stream currents and drag, which will be taken up a little later.

It is the hope and dream of every true follower of Izaak Walton to be on the stream when a hatch is in progress. Most often these hatches come in the evening. The writer has stood beside the pool of one of his favorite streams in the Catskills of New York of an evening and has seen literally hundreds of insects emerging from the surface of the water. So many have been in the air at a time that it was possible to catch some of them in one's hand; one could examine the sample and frantically search through a fly box in hopes of finding a correct imitation of a natural. This hatch of flies, as they come off the surface of the water, is one of nature's most interesting phenomena.

HYDRAULICS

To return to first principles, fly fishing consists of two distinct schools: the wet fly and the dry fly. Much heated argument has arisen between these two schools as to the most effective way to catch fish. In all fairness it must be said that both methods have their merits, depending on water and air conditions. The writer favors the dry fly, yet on occasion it does become necessary to use the wet when the water is high or slightly discolored. It is the fascination of the dry fly method that is undeniable. This calls for the closest coordination between the hand and the eye; it develops to the greatest extent one's reflexes and reaction time. And now our discussion of dry fly fishing leads directly to the subject of hydraulics.

We must fish up stream and endeavor to the utmost to have the floating fly follow the current as though there were no connection between the fly and the fisherman. This sounds extremely simple, but as a matter of fact it is the most difficult operation that we have to learn. Unless the fly floats with the current the chances are that the trout will refuse it. If there is any cross pull or any motion imparted to the fly except that caused by the natural currents, no results may be obtained. When a line and leader fall across swift water and drop the fly on to a more quiet portion of the stream, the tendency is for the line to travel faster than the fly, so that the fly is dragged somewhat across current.

Reference to *Fig.* 3 will indicate three typical cases. *A* in every case represents the position of the fisherman, *B* that of the trout, and *C* where the fly will drop. The arrows represent relative velocities of the surface current. It is always wise to drop the fly some three or four feet above the feeding fish so that it may float down with the current over the spot where he is most likely to rise. *Fig.* 3 *(a)* represents the straightaway stream with a uniform current. It presents no great difficulties, as the fly will be dropped at *C*, and the leader and the position of the line on the water will move at a uniform rate. In *(b)* we have a much more complex problem. There is a sharp bend in the stream and naturally the current will be swifter on the side where the fish is located. Here if the line and leader are placed as in *(a)*, by the time the fly is expected to reach the fish it will be pulled out into the current and pass considerably to the left of him. The same condition will hold in *(c)*, even though the bend of the stream is reversed. To overcome this difficulty the expert has developed what he calls a loop cast. In *(b)* there has been thrown a downstream loop with some slack line and leader. The current against the bank is much swifter than in the center of the stream; therefore, the fly will travel faster. The loop then permits enough leeway so that the fly will float directly down over the fish without any side pull while the loop is straightening out. In *(c)* the situation is reversed, and the fisherman throws an upstream loop so that by the time the fly reaches the fish the line and leader will have straightened out, as is indicated by the small dotted line. In this connection it might be said that in the diagram *(c)* the most probable place for a trout would be at *D*. However, at times one finds a good fish in the quieter water, particularly if there is an overhanging bush or cover such as is indicated in the drawing. In fishing the water at *D* it would be much better if one were to move over to the other side of the stream and fish from the opposite bank. Were he to cast from *A*, as shown in the drawing, for trout at *D*, he would "line" the fish. This simply means that there would be no way of placing the fly over the fish without either the line or the leader first passing over the trout. Such an effect almost invariably scares the fish or "puts him down."

The loop is not too difficult to execute. In throwing an upstream loop one carries through the cast as usual, but holds the rod in a horizontal position. At the end of the cast he gives it a slight jerk back against the direction of motion. This throws the loop, the convex side of which is upstream, as in *(b)*.

Everything else being equal, the more the surface of the water is agitated, the nearer one can usually approach the trout. Pockets behind boulders and slack water along the edges of the stream often hold a good fish, and if one can drop a fly on one of these places the response is sometimes immediate and satisfying.

OPTICS

In order to get the trout's point of view one must mentally project himself into the trout's environment under water. This introduces a study of optics. A trout usually points upstream into the current, and for that reason the dry-fly fisherman approaching from downstream has the distinct advantage. What the fish sees of our world is limited to what is commonly known as his window. It is as though the under side of the surface of the water were a mirror with all of the stones and underwater objects on the stream bottom reflected against it, except directly overhead, where there is a circular area through which the trout looks into our world. Reference

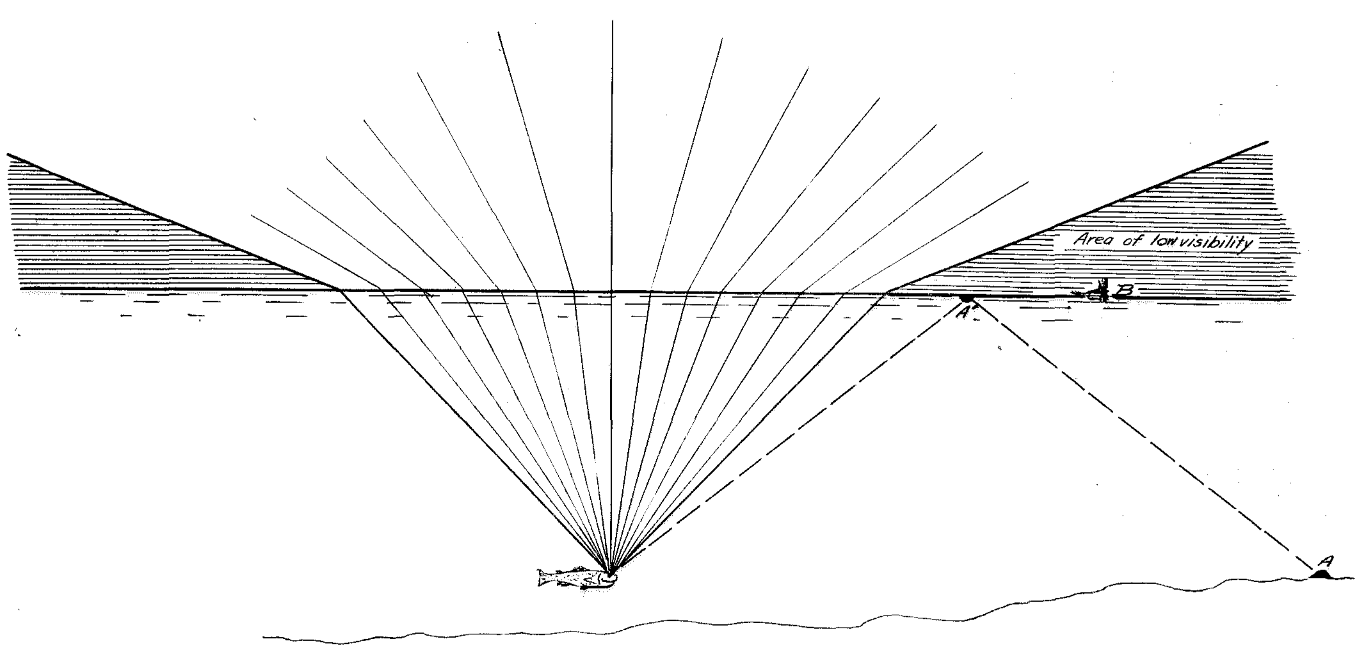


FIG. 4: The trout's window.

FIG. 5: The fisherman as he looks to the fish. (Courtesy of American Museum of Natural History, New York.)

is made to *Fig.* 4. Vision is restricted to the fish from reflected rays from objects outside of the water. A ray of light coming from directly overhead will go directly to the fish. Any ray coming from any other point except directly overhead will be refracted, the angle to the horizontal becoming flatter as the edge of the window is approached. Remember that this window is circular and can be compared to a funnel with the small end at the fish's eye. Finally we reach a point, shown by the very heavy line, where only a small portion of the rays will penetrate the water, most of them will be reflected up, so that anything in the shaded area will be less visible to the fish than in the non-shaded area.

Objects on the bottom, such as the stone at *A*, will be reflected at *A'*, and be seen by the fish. It must be remembered that wherever the fish moves, the window moves with it; also, that the closer to the surface he is, the smaller will be his window and consequently, the less he sees of our world. This accounts for a question which at one time puzzled the writer—why it is possible for him to approach so much nearer in shallow water than in deep water before he is seen by the trout. At *B* is an artificial fly floating on the surface. Imagine the current flowing from right to left and the fish heading into the current. This particular trout will be conscious of something coming towards him, possibly food. He is conscious of this because the water surface has been broken and he sees a distinct sparkle. Just as soon as the fly enters his window he will be able to see whether or not it may be palatable. If he believes it is, then he will rise for a closer view. If it is an artificial fly, and we have done our part correctly, he will undoubtedly take, much to our satisfaction, and to his disappointment. If the fly is not moving with the current as though it were detached from our equipment, but is dragging across current, it is safe to say that he will refuse it.

Inasmuch as the rays of light reaching the fish are bent or refracted, objects outside of the water have a decidedly distorted look to the trout. It is interesting to know that Mr. Eugene Connett III in his book *Random Casts* states that a man standing six feet above the water 15 feet away from the trout appears to the trout to be 15 inches high; at 30 feet, nine and a half inches. His apparent breadth is not greatly affected, so that he must appear as though he had been telescoped. *Fig.* 5 is a reproduction from the American Museum of Natural History showing how the fisherman looks to the trout. That portion of him below the surface of the water looks quite natural to us, but what the fish sees through the window is considerably flattened.

The often repeated warning not to let your shadow fall on the water is excellent advice. However, the fish does not have an eyelid and cannot close its eye as a human being does; consequently, when the sun is shining on the eye which is on the side of the sun it is more or less blinded. This gives the fisherman the distinct advantage, if he approaches the fish between the sun and the fish rather than on the shaded side. By casting the fly on the far or shaded side, he causes the trout to see it with his eye away from the sun.

Another point to remember is to keep as low as possible, trying to blend in with the foliage, if there is any. Also, one's clothing should be of a subdued color. Avoid wearing anything white, remembering that reflected light from a white object will carry to the trout almost as readily as though a mirror were reflecting the light. Often with the sun in one's face when facing upstream the light is reflected directly back into the water, while with the sun on either side it will be reflected away to the far bank. And don't forget that a rod held high is more visible than one held low with the cast being made from the side.

One word as to the fish's conception of color. It has recently been shown with an evident degree of validity that he does have a conception of color. This was accomplished by experimenting with color in certain foods; the fish always selected the color which was the most palatable.

It is questionable whether or not the sight of a fish is as important as his reactions to vibration. There is a so-called lateral line running along the fish's side, marking a highly sensitized nerve. It is this lateral line that warns him of approaching enemies by the vibrations set up in the water. For this reason, extreme care should be taken when wading and walking along the banks, particularly if they are undercut, as we find them in some of the meadow streams. Roule, in his book, *Fishes and Their Ways of Life*, says, "On the basis of the vibratory impressions, which the water transmits, the fish come or turn aside, avoid and flee, according to the reflects provoked." Authorities have stated that the ear of the trout is rudimentary; that is to say, as a means of hearing its chief function is to maintain a sense of equilibrium.

It is believed that a trout is always foraging for food unless disturbed by the instinct of self-preservation. Sustaining life by the search for food, and sustaining life by protection from enemies—these are the two main instincts. Often when a fish is hungry his fear of harm will be unbalanced by his desire to eat. It is at this time that the fisherman really meets with success.

CHEMISTRY

Chemistry enters into our fishing to a slight extent. Mention has already been made of the DuPont nylon in replacing the silkworm.

We know that a range of temperature from 50 to 65 degrees Fahrenheit is the most ideal range for dry fly fishing. When the water reaches 74 degrees, it is almost impossible to interest a fish in any artificial fly. The oxygen content of water is proportional to its temperature. As the temperature rises the oxygen content diminishes and the activity on the part of the fish also diminishes. It is for this reason that the expert will carry a stream thermometer to determine whether or not the maximum temperature has been exceeded. If at all possible, he will seek those places where spring runs enter the stream or where the more aerated water is. The writer has noted one exception to this rule, the Fire Hole River in Yellowstone, which has furnished some excellent dry-fly fishing where the water temperature was above the 74 degree mark. Apparently the fish in this stream must have adjusted themselves to higher temperatures.

The growth of trout is dependent upon the oxygen content, the temperature of the water, and the food supply. On Hot Creek in the High Sierras, the fish culturists have noted a growth of one inch per month, up to a total of approximately six to seven inches. The temperature here is virtually uniform the year around, and the food supply is more than abundant. Hot Creek is practically ideal—the laboratory type of stream for trout growth.

METEOROLOGY

The subject of meteorology has definitely some bearing on trout fishing. It is known that the barometric pressure influences the results to a marked extent. On a falling barometer the fisherman may as well stay at home, as far as any fly fishing is concerned. Once the barometer reaches its lowest point, it may linger there until the storm center has passed and his chances may slightly improve. Once, however, the barometer starts up or is in a high position, the prospects are excellent. We do not know why an approaching storm affects the fishing, but the writer has seen this condition hold in almost every instance.

A few years ago on the upper Owens River he was fishing with a friend during a storm in October. The net result was two small trout—one apiece. That night the weather cleared, and the next day, a beautiful sunlit day, a second trial was made. The fishing took place over the same stretch of water, with the result that each fisherman took a limit in one morning. The day before, one would have reached the conclusion that there were no trout in the river.

The same experience was met with on one of the Montana streams last July. A fisherman's barometer was carried on the trip and a careful record kept of the pressure changes. In two weeks' time two different storms developed, each of a day's duration. As the barometer fell the fishing was not worth the effort, but immediately on its starting to rise, and after it had come up to a normal position, one had no trouble in taking all the fish he desired.

AT RIGHT:
FIG. 6: The author hooks a good one.

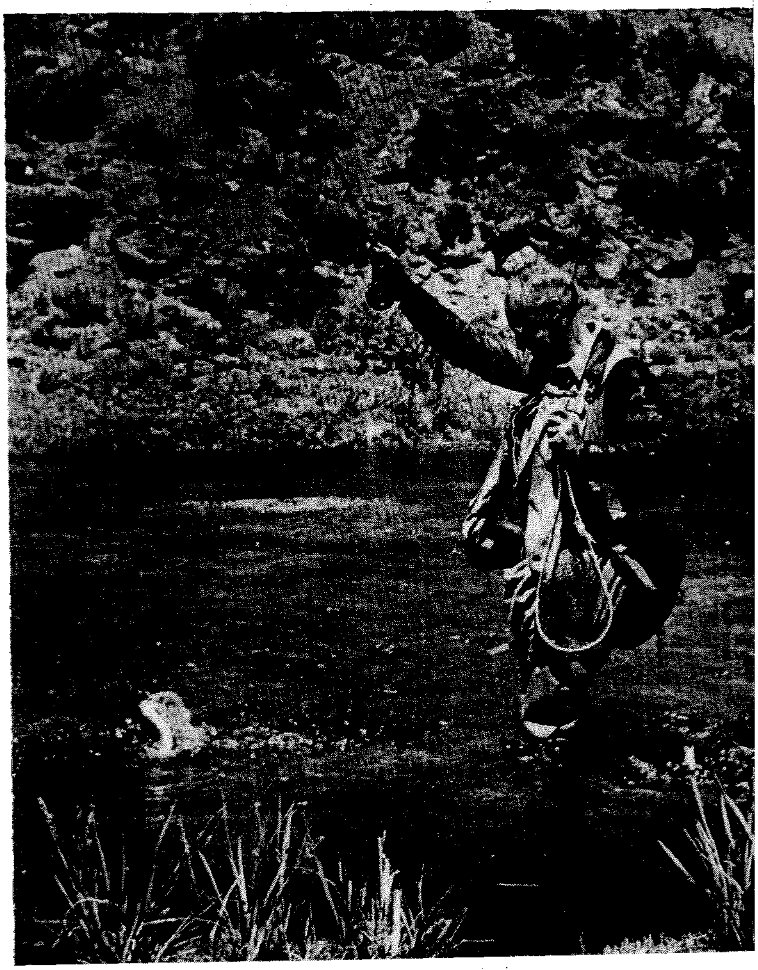
THE THREE ESSENTIALS

In the writer's opinion there are three main things in dry-fly fishing which contribute to success. One is the pattern of the fly, another the size, and the last, the way the fly is presented. Of the three, the presentation is the most important, having a weight of possibly 65 per cent, while the size may be weighted at 20 per cent, and the pattern at 15 per cent. This will sound like heresy to the wet fly fisherman, but it must be remembered that the dry fly is under discussion.

The writer has deliberately changed from one pattern to another, when the fish were rising, with equal success, as long as he did not select some outlandish creation. The size certainly has a distinct bearing on the way the fish respond, although when there is a large hatch of small flies it is often impossible to interest a trout in the exact artificial reproduction. This may be because a slight drag takes place and is readily detected by the fish. Why should he be interested in an artificial fly when there are hundreds of natural insects that he may take? It is never entirely possible to imitate a natural exactly, no matter how carefully the fly may be fashioned. The hook is aways there, and will definitely show below the surface of the water. Sometimes when a pattern entirely different from the natural one on the water is used, the trout's curiosity seems to get the better of him. Maybe at that particular moment he wants a change of diet—anyway, it is sometimes worth trying.

Emphasis must be placed on the fact that the way the equipment is handled and the fly presented is the most important single point that the fisherman has to master. One of the best fishermen that the writer has ever had the pleasure of watching never used anything but one pattern.

(Continued on Page 15)



PORTRAITS of WILLIAM GILBERT—1544-1603

By E. C. WATSON[1]

THE 400th anniversary of the birth of William Gilbert of Colchester, who—as Priestley so quaintly wrote in 1767—"may justly be called the father of modern electricity, though it be true that he left his child in its very infancy," occurs this year.[2] It is therefore fitting to reproduce his likeness at this time in commemoration of this anniversary.

The only contemporary portrait of Gilbert known to exist at the present time is a small panel painting discovered by the late Silvanus P. Thompson. It was used by Charles Singer to illustrate an article entitled "Dr. William Gilbert (1544-1603)" which was published in the *Journal of the Royal Naval Medical Service* for October, 1916. *Fig. 1* is a very poor reproduction made from a reprint of the article.

An original portrait, probably painted by Cornelius Jansen and bearing the date "1591, aetatis 48" is mentioned by Hearn in his *Letter Containing an Account of Some Antiquities between Windsor and Oxford, with a List of the Several Pictures in the School Gallery Adjoining the Bodleian Library*, 1708, p. 33. This is probably the painting which Gilbert is said to have ordered made of himself for presentation to the University of Oxford. A manuscript entry at Oxford, however, states that it was removed as decayed in 1796. There remains only a poor engraving by Clamp, made in 1796, and not true to the original portrait in several details. However, this engraving, which is reproduced in *Fig. 2*, has preserved something more of Gilbert's outward appearance than his pointed beard, ruff, and high hat. "The keen straightforward searching glance, the twinkling play of good-humored sarcasm, ready to vent itself on all 'old wives' gossip' and 'foolish vanities,' the frank, fearless, open countenance, intolerant only of shams and frauds—all these characteristic traits of the man are not untraceable in the portrait."

Arthur Ackland Hunt made use of Clamp's engraving for his well-known historical painting of Gilbert showing his experiments on electricity to Queen Elizabeth and her court, which is here reproduced in *Fig. 3*. This painting was presented by the Institution of Electrical

[1]Reprinted with some revisions and additions from the *American Journal of Physics, 12*, 303 (1944).

[2]The date of Gilbert's birth is usually given as 1540, since the mural tablet placed by his brothers over his burial place in the chancel of the church of Holy Trinity, Colchester, states that he died in 1603 in the 63rd year of his age. However, Silvanus P. Thompson, who is the chief authority for the life of Gilbert, considered the correct date to be May 24, 1544.

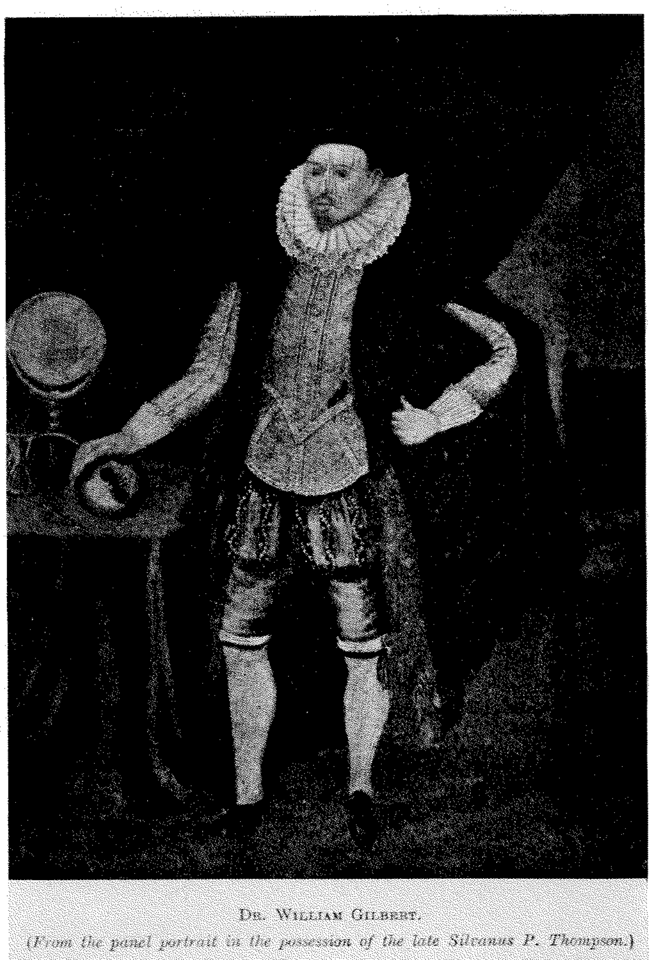


FIG. 1: Panel portrait of William Gilbert. (From the panel portrait in the possession of the late Silvanus P. Thompson).

FIG. 2: Engraved portrait of William Gilbert. (From the engraving by Clamp, published by S. E. Harding, May 1, 1796, in the "Biographical Mirror").

FIG. 3: Gilbert showing his experiments on electricity to Queen Elizabeth and her court. (From the painting by A. Ackland Hunt, Town Hall, Colchester, England).

Engineers to the Corporation of Colchester on December 10, 1903, the 300th anniversary of Gilbert's death.

The charming word picture of Gilbert given by Thomas Fuller in his *History of the Worthies of England* (1662) is worth quoting in its entirety in this connection. The quaint and witty style is characteristic of Fuller who states that his information came from a near kinsman of Gilbert's. Fuller wrote as follows:

> "William Gilbert was born in *Trinity Parish* in *Colchester*, his Father being a *Counsellour* of great Esteem in his Profession, who first removed his family thither from *Clare* in *Suffolk*, where they had resided in a Gentile Equipage some Centuries of Years."

> "He had (saith my informer) the *Clearness* of *Venice glass* without the *Brittleness* thereof, soon *Ripe* and long *lasting* in his Perfections. He Commenced *Doctor* in *Physick*, and was *Physician* to Queen *Elizabeth*, who Stamped on him many marks of her Favour, besides an Annuall Pension to encourage his Studies. He addicted himself to *Chemistry*, attaining to great exactness therein. One saith of him that he was *Stoicall*, but not *Cynicall*, which I understand *Reserv'd*, but not *Morose*, never married, purposely to be more beneficiall to his Brethren. Such his *Loyalty* to the Queen, that, as if unwilling to survive, he dyed in the same year with her 1603. His *Stature* was *Tall*, *Complexion Cheerfull*, an Happiness not ordinary in so hard a Student and retired a Person. He lyeth buried in *Trinity Church* in *Colchester*, under a plain Monument."

> "*Mohomets Tombe* at *Mecca* is said strangely to *hang* up, attracted by some invisible *Load-stone*, but the Memory of this *Doctor* will never *fall to the ground*, which his incomparable Book *De Magnete* will *support* to Eternity."

Gilbert's contributions to science have been admirably summed up by Silvanus P. Thompson, the chief authority for his life and work as follows:

> "Gilbert's renown rests not on his eminence as a physician, but on his achievements in the foundation of the twin sciences of electricity and magnetism. He is beyond question rightly regarded as the Father of Electrical Science. He founded the entire subject of Terrestrial Magnetism. He also made notable contributions to Astronomy, being the earliest English expounder of Copernicus. In an age given over to metaphysical obscurities and dogmatic sophistry, he cultivated the method of experiment and of reasoning from observation, with an insight and success which entitles him to be regarded as the father of the inductive method. That method, so often accredited to Bacon, Gilbert was practicing years before him."

Thompson's papers and lectures on Gilbert are all of great interest. Unfortunately, many of them were privately printed and so are not readily available. It may be of value, therefore, to list them here. They include the following titles:

Gilbert of Colchester; an Elizabethan Magnetizer. (Privately printed at the Chiswick Press, London, 1891).

William Gilbert, of Colchester, Founder of the Science of Electricity, THE ESSEX NATURALIST, 5, 50 (1891).

Notes on the De Magnete of Dr. William Gilbert, (Privately printed at the Chiswick Press, London, 1901).

Gilbert of Colchester, Father of Electrical Science, Gilbert Tercentenary Commemoration of the Institution of Electrical Engineers. (Privately printed at the Chiswick Press, London, 1903).

William Gilbert, and Terrestrial Magnetism in the Time of Queen Elizabeth. A discourse before the Royal Geographical

Society. (Privately printed at the Chiswick Press, London, 1903).

Gilbert, Physician: A Note prepared for the Three-Hundredth anniversary of the Death of William Gilbert of Colchester, President of the Royal College of Physicians, and Physician to Queen Elizabeth. (Privately printed at the Chiswick Press, London, 1903).

The Family and Arms of Gilbert of Colchester, Transactions of the Essex Archaeological Society 9, 197 (1906). (Read before the Society on June 25, 1903).

Other books, articles, and lectures dealing with the life and work of Gilbert are the following:

William Gilbert of Colchester, Charles E. Benham, (Colchester, 1902).

Bacon, Gilbert, and Harvey, Sir William Hale-White, (London, 1927).

"*William Gilbert*," *Dictionary of National Biography*, Sir Norman Moore.

William Gilbert of Colchester on the Loadstone and Magnetic Bodies, P. Fleury Mottelay, (New York, 1893).

William Gilbert, of Colchester, Conrad William Cooke, ENGINEERING, 48, 717, 729 (1889).

Dr. William Gilbert (1544-1603), Charles Singer, JOURNAL OF THE ROYAL NAVAL MEDICAL SERVICE, October, 1916.

William Gilbert and Magnetism in 1600, R. B. Lindsay, AMERICAN JOURNAL OF PHYSICS, 8, 271, (1940).

William Gilbert and the Science of his Time, Sidney Chapman, NATURE, 154, 132 (1944).

William Gilbert: His Place in the Medical World, Walter Langdon-Brown, NATURE, 154, 136 (1944).

There are two English translations of Gilbert's *De Magnete, Magneticisque Corporibus, et de Magno Magnete tellure; Physiologia nova, plurimis argumentis, experimentis demonstrata* (London, 1600. Later editions, Stettin, 1628, 1633; Frankfort, 1629, 1638), one by P. F. Mottelay entitled *On the Loadstone and Magnetic Bodies, and on the Great Magnet the Earth. A New Physiology, demonstrated with many arguments and experiments*, (New York, 1893) and one by the Gilbert Club entitled *On the Magnet, Magnetick Bodies Also, and on the Great Magnet the Earth; a new Physiology, demonstrated by many arguments and experiments* (London, 1900). The latter is the definitive translation and is, as far as circumstances would permit, a facsimile (in English) of the original Latin edition of 1600.

"The Old Order Changeth"

(Continued from Page 4)

venture, it is this one. And if ever there was a time for casting aside our minor doubts and differences, it is now.

Let it be hoped that we will not concern ourselves too much with the mere mechanics of a world organization or focus our discussions upon this or that feature of its framework. It is easy to pick flaws in any scheme of organization, national or international. No group of men, or even of supermen, can hope to devise a scheme which will conform to the desires of all nations, great and small, or which will not offend the sensibilities of some. The conflicting ideologies of today cannot be reconciled in any charter of freedoms. It is enough that whatever plan is inaugurated shall be sufficiently mindful of the realities to make it serve a world that is rather than one which is not.

Realism demands, for example, that the initiative and the dominating leadership in any plan of world organization which hopes to be effective must rest at the outset in the hands of those nations which have accomplished the great task of saving the world from catastrophe. The United States, Great Britain and Russia are the only nations which at the close of this war will have the power and the prestige to provide the rest of the world with collective security. If these three nations hold together, and work together, they can guarantee that no aggressor nation or group of aggressors shall challenge the preservation of peace for many years to come. If they do not hold together and work together during the years following the close of the war, then no paper guarantees for the maintenance of peace will much avail.

This is a stark reality of the present world situation, and one which in its importance outweighs all the others. To insure that the United Nations shall stay united will require large concessions from all of them, and not least from ourselves; but our willingness to do whatever is required should be in keeping with the magnitude of the disaster which must result if unity fails.

But while the initiative and the leadership in forming a world organization must be supplied by joint action of a few dominating powers, it seems equally clear and essential that the responsibility for the prevention of future aggression must be assumed in the long run by *all* the peace-loving nations of the earth and not by any single group of them. To this end it is necessary that the world organization shall have an assembly or great council in which all eligible nations are represented, and equally represented. They should have equal representation because all nations, whatever their size or importance, are equal in their rights at international law. A full recognition of this fundamental principle must be the corner-stone of any world organization which sets out to establish and maintain a reign of law and justice among the nations.

One should hasten to point out, however, that there is no inconsistency between equality of rights and inequality of power and influence. Nations, like states, can have a wide disparity in population, resources and prestige while nevertheless maintaining a fundamental equality in all their rights and privileges. In the sisterhood of American states, New York and Rhode Island are far from being equal in stature; but in their rights as states, under the Constitution and the laws, they are on a plane of guaranteed equality. It is to the everlasting credit of those who framed the Constitution of the United States that by a great compromise they succeeded in devising a plan whereby the equality and the inequality of the states could be harmonized in the same structure of federal government. Americans should have no difficulty, therefore, in reconciling themselves to a form of international organization which accords equality of representation to all member nations in one council while denying them this privilege in the other. We have been familiar with that working arrangement for over 150 years.

There remains, however, the most crucial question of all. How shall a world organization, whatever its form, make its decisions effective? This goes to the heart of the whole problem, for no international body can hope to prevent aggression unless it is given the physical power to prevent aggression. The experience of the past thirty years, if it has proved anything, should be enough to demonstrate that neither treaties, covenants, nor solemn pledges of non-aggression suffice to guarantee the preservation of peace when gangster nations set out to take the law into their own hands. If the world is to have a surcease from international banditry during the next generation it will be because we have shown ourselves able to create, somehow or other, the means of promptly and decisively meeting force with force whenever an aggressor nation resorts to force. No realistic view of the world in which we live can lead to any other conclusion.

Participation of the United States in such an international force, moreover, is not a matter of choice but of necessity. Without such participation our adherence to any form of world organization would be a futile gesture. There will be objection, of course, that to pledge the use of American armed forces in any enterprise not wholly within the discretion of our own government would be to surrender a portion of the national sovereignty. That, to my mind, is merely shadow-boxing with words. If by sovereignty we mean unlimited freedom of action, without any restraint, then no such thing has ever existed in this country, or anywhere else. All governments limit their freedom of action wherever and whenever it is in the national interest to do so. Every treaty that has been made since the establishment of the Republic is in effect a restraint upon the nation's freedom of action.

The danger is, of course, that when the time comes we will not flatly decline to contribute our share to an international force for the preservation of peace under the control of a world security council, but will conjure up such reservations to the use of this force as will make it slow in motion and relatively ineffective for its purpose. To insist, for example, that American armed forces shall never be used to preserve world peace save with the explicit authorization of Congress would be to render our participation subject to weeks and months of debate and delay. It would destroy the capacity for prompt action which is the prime essential of success in all military interventions.

Unhappily the American procedure for the approval of international agreements is such that it lends every encouragement to the strategy of senatorial mutilation. A treaty, whatever its provisions, goes into the Senate with the chances two to one against its emergence in any recognizable form. While it does not seem likely that the Senate of the United States, in the present temper of public opinion, would definitely reject the whole idea of using American armed forces at the behest of a world organization, there is no inconsiderable chance that it would proceed to burden the plan with emasculating reservations.

This danger is what has prompted the suggestion that instead of proceeding by treaty there should be presented to both Houses of Congress a joint resolution declaring the willingness of the United States to participate in an international force for the preservation of world peace and vesting in the executive branch of the government full discretion to authorize the use of American armed forces when the occasion arises. Such action would require only a majority vote in both Houses of Congress instead of a two-thirds vote in one of them. It would have ample precedent for its use since Congress on several notable occasions in the past has done things by joint resolution in preference to proceeding by treaty. The annexation of Texas just a hundred years ago was accomplished by a joint resolution of Congress; so was the annexation of Hawaii in 1898. The Constitution gives the Senate power over the ratification of treaties, it is true; but the Constitution is equally explicit in giving to Congress as a whole the power to take all steps that are necessary and proper for the national defense. So Congress can, if it so chooses, declare the adhesion of the United States to a world security organization by means of a joint resolution and there would be definite political advantages in such procedure.

Back in the eighteenth century the 13 newly-independent American colonies became the leaders of civilized mankind by pointing the way to the solution of a great problem which the rest of the world had all but given up. They proved that a group of sovereign states could set up a new government and endow it with powers while yet retaining their own integrity. They demonstrated to the rest of the world that national strength could be successfully combined with local self-government, religious freedom with a stablized social order, and free enterprise with civil liberty. May we not hope that America, as we approach the middle of the twentieth century, may once more direct humanity along the paths to international order, justice and peace.

Trout Fishing

(Continued from Page 11)

This man was so good that it was an education in itself to have the privilege of just walking along with him and watching him work. True, he fished but one stream and knew it by heart, but nevertheless, he always seemed to be able to catch the fish.

The author remembers not so much the weight of the contents of his creel after a day's fishing, but rather the riot of color of the wild flowers along a Sierra stream in July; the light pouring down through the October aspens like a stream of liquid gold; rhododendron in bloom in June along the Rondout in the Catskills; azaleas along the Oconalufay in North Carolina; wild blackberries in profusion on the Rogue in Oregon; the fragrance of the pines on a warm summer's day on the bank of the Naches in Washington; beavers at work in the early evening on the Gallatin in Montana; a moose startled by the intruder on the Grayling; a wildcat streaking across an open meadow, and pausing a moment at the edge of the timber for a farewell look, in the high country of New Mexico; the deer drinking from a pool along the crystal waters of the Neversink; a sleek mink scampering across a log on an unnamed stream in Colorado; a band of antelope near the Lost River in Idaho; the sunsets on the Owens River with the Sierras as a backdrop across the meadows; and his once coming face to face with a bear on the Red River of the Adirondacks. These, and countless other memories, are what he cherishes during the long winter months of the closed seasons. The solitude, the peace, the quiet, and the time for reflection are the things that bring the trout fisherman just a little closer to nature than one can get in almost any other sport.

NAVY HONORS ARTHUR H. YOUNG

THE United States Navy recently gave a signal honor to Arthur H. Young, industrial relations consultant of California Institute of Technology and former vice-president of the United States Steel Corp.

At a luncheon ceremony held at the Athenaeum, Mr. Young was presented with a certificate of award for meritorious civilian service to the Navy in connection with the Navy Manpower Survey Board, of which he was the civilian representative for the 11th District. The luncheon was given by the Industrial Relations Section of Caltech, of which Prof. Robert D. Gray is head. Rear Adm. Ralston S. Holmes, U. S. Navy (Ret) presided and the award was presented in behalf of the Secretary of the Navy, James V. Forrestal, by Rear Adm. I. C. Johnson, director of officer procurement for the 11th Naval District.

Mr. Young was praised for his unstinting work with his large experience of a lifetime as one of the nation's top industrial leaders. In addition to the certificate, signed by Secretary Forrestal, a lapel emblem was presented to Mr. Young.

C. I. T. NEWS

ROCKET RESEARCH AND DEVELOPMENT

ONE of the war activities at California Institute of Technology has been revealed as research and development work on rocket projectiles. Begun in September, 1941, this work has already resulted in a variety of rocket weapons which are in effective service use. One type of rocket projectile has been employed for over two years in antisubmarine warfare. Another type was used in the invasions of North Africa, Sicily, Italy and France, in the landing on Arawe, and in subsequent island-hopping in the South Pacific. It is now standard equipment for all amphibious operations. More recently, air-borne rockets have been developed as armament for carrier-based and amphibian planes, and have been used successfully against German submarines in the Atlantic and against Japanese shipping and land installations in the Pacific.

This information was revealed in an official Navy press release on August 6, 1944. The release explained that rocket work at the Institute is carried on cooperatively by the Navy and a National Defense Research Committee group of Institute scientists and engineers, under contract with the Office of Scientific Research and Development. (The latter is the Federal contracting and spending agency for the promotion of research contributing to the war effort; the National Defense Research Committee is a technical advisory committee within OSRD which recommends and supervises contracts).

The principal advantages of rockets are great fire power and mobility. Since rockets involve no recoil problem, they are particularly well adapted to installation on light landing craft, airplanes, and motor vehicles. The launching device is relatively simple and cheap to manufacture, is light in weight, and easy to install. In warfare involving rapid movement, these factors are highly important, since they enable the accumulation of great fire power much more rapidly than can be done with conventional artillery.

Rocket work, once initiated at the Institute, made rapid progress because of the close cooperation of the War Department, the Navy Department, and the Office of Scientific Research and Development. Dr. Vannevar Bush, Director of the OSRD, made ample funds available for the work and encouraged it in every possible way. The Navy followed the work closely from the start and used every means to expedite it. Rear Admiral Ralston S. Holmes, who was Commandant of the Eleventh Naval District when rocket work began at the Institute, made the facilities of the district available for testing purposes; and upon his retirement in January, 1943, he was assigned to the Institute as Navy Department liaison officer. Testing range facilities have been provided by the Fleet Marine Force, San Diego Area, and by the Army Service Forces.

Development of the Navy's new ordnance test station at Inyokern has provided additional facilities for close cooperation between the Navy and the Institute rocket group. A Navy press release of August 8, 1944, disclosed details of this world's largest naval ordnance test station, which extends over parts of San Bernardino, Inyo, and Kern counties and covers an area of 815 square miles. At present the primary emphasis at Inyokern is on aircraft ordnance. Testing ranges and other facilities are constantly being expanded; and under the direction of Captain Sherman E. Burroughs, Jr., Commanding Officer, close cooperation is maintained with the Institute group.

The most recent rocket developments must remain for the present in the realm of military secrets. The magnitude and importance of the work can be seen from the fact that rocket research and development stand almost at the top of the list of manpower and materials priorities, and the Army and Navy are placing rocket production contracts totaling hundreds of millions of dollars.

NEW COMMANDING OFFICER, V-12 UNIT

CAPTAIN WENTWORTH H. OSGOOD, U.S.N. (Ret.), the new commanding officer of Caltech's Navy V-12 training unit, is a naval officer of broad experience. Possessed of as likable personality as his predecessor, Commander E. W. Mantel, Captain Osgood is rapidly becoming as popular on the campus as was the man he succeeded.

A native of Columbus, Ohio, Captain Osgood attended Ohio State University before his appointment to the United States Naval Academy. He was graduated from Annapolis with the class of 1912 and immediately went on active duty. In World War I he was in the destroyer

CAPTAIN WENTWORTH H. OSGOOD

service out of Brest, France. After the war he had various assignments, including the Navy postgraduate schools and the Navy petroleum reserve.

*In 1932, Osgood retired with the rank of lieutenant-*commander and built a home at 1520 Charlton Road, San Marino, engaging in private business in Los Angeles. He was recalled to duty by the Navy on July 1, 1939, and has served since at Washington and at the advanced naval base in Puerto Rico.

Captain (then Commander) Osgood came to the Institute in October, when Commander Mantel was given an undesignated assignment.

OCTOBER COMMENCEMENT

FIFTEEN HUNDRED persons attended the commencement exercises of the Institute at Pasadena Civic Auditorium October 20, and many more witnessed a colorful parade of V-12 Navy trainees through the streets and watched a review in front of the City Hall.

Receiving Bachelor of Science Degrees and Senior Certificates were 110 undergraduates, while other degrees were awarded as follows: Doctor of Philosophy, 10; Aeronautical Engineer, 1; Civil Engineer, 1; Master of Science in Engineering—Aeronautics, 1; Civil Engineering, 3, and Mechanical Engineering, 4; Master of Science in Science—Geology, 1, Physics, 1.

The invocation and chaplain's address was delivered by the Most Rev. Joseph T. McGucken, S.T.D.

Dr. William B. Munro, Edward S. Harkness professor of history and government, delivered the commencement address on the subject, "The Old Order Changeth . . . " (See Page 3 of this issue).

Candidates were presented by Winchester Jones, associate dean of upper classmen; Dr. William R. Smythe, chairman of the Science Course Committee; and Franklin Thomas, chairman of the Division of Engineering and dean of upper classmen.

The degrees were conferred by Dr. Robert A. Millikan, chairman of the Executive Council, who, in an address on "The Institute and Postwar Defense," said that the old prewar life cannot be recaptured completely when peace comes. He viewed several changes with favor, including the proposed military training of one year for every youth at the completion of high school.

DEATH OF CLYDE WOLFE

Doctor Clyde Wolfe, formerly an instructor at C.I.T. and recently on the staff of the Cyclotron Project at Berkeley, passed away suddenly the latter part of March. He dropped dead apparently from a cerebral hemorrhage. Dr. Wolfe was well liked by members of the staff of the Cyclotron Project and his passing has meant a great loss to his intimates. At the time of his death, he was in line to take charge of a large section of computers on the project.

ATHLETICS

COACH CARL SHY opened Varsity basketball practice on November 8 with a squad of 60 men reporting. After the various cuts, 11 men were retained on the "A" squad and 15 on the "B" squad. All of these men are V-12 trainees.

Included on the "A" squad were six returning lettermen, co-captains, Paul Nieto guard and Hugh West forward, Bernie Wagner and Hal Ball centers, Stuart Bates and Jack Cardall guards. Newcomers are Dennis Ahern from the University of South Carolina and Dick Roetteger forwards, Clarence Woodward center, John Schimenz from University of Kansas and Jerry Schneider guards. All of these men are fast, good shots, and clever ball-handlers, but they lack height.

In the opening game, Tech snowed under a supposedly strong Vultee team 84-36. Coach Shy started West and Bates at forward, Wagner at center, and Nieto and Schimenz at guards. Wagner is the tallest man in this lineup, just topping six feet, but in this game, the fast breaking offense more than offset the lack in height. West and Nieto led the scoring procession with 17 and 16 points apiece, while Woodward and Schneider scored 15 and 14 points each.

A new league consisting of U.C.L.A., Occidental, Pepperdine and Caltech has been formed for the basketball season, with each team meeting each other in home-and-home games. All Caltech home games will be played at the State Guard Armory, 145 N. Raymond, which floor is also being used this year for practice. The "B" team, coached by Chief Specialist Gene Mako, plays the preliminary at 6:45 P.M. at all games.

SCHEDULE

Day		*Opponent*	*Place*
Friday, Dec.	1	Vultairians	CALTECH
Friday, Dec.	8	U.S.C.	U.S.C.
Saturday, Dec.	9	Santa Ana Army Air Base	Santa Ana
Saturday, Dec.	16	Camp Ross (Wilmington)	Camp Ross
Thursday, Dec.	21	Camp Ross	CALTECH
Friday, Dec.	29	U.C.L.A.	CALTECH
Tuesday, Jan.	2	Los Alamitos Naval Air Station	CALTECH
Friday, Jan.	5	Occidental	Occidental
Saturday, Jan.	6	March Field	March Field
Tuesday, Jan.	9	Pepperdine	CALTECH
Saturday, Jan.	13	Redlands	CALTECH
Tuesday, Jan.	16	U.S.C.	CALTECH
Saturday, Jan.	20	Pepperdine	Pepperdine
Saturday, Jan.	27	Redlands	Redlands
Tuesday, Jan.	30	March Field	CALTECH
Saturday, Feb.	3	U.C.L.A.	U.C.L.A.
Tuesday, Feb.	6	Santa Ana Army Air Base	CALTECH
Friday, Feb.	9	Occidental	CALTECH
Saturday, Feb.	10	San Diego Naval Training Station	San Diego

ALUMNI NEWS

CALTECH ALUMNI MEETING

On the night of November 9, Caltech Alumni and their ladies met at Eaton's Rancho on Ventura Boulevard to enjoy a chicken dinner, which preceded a meeting held at the Walt Disney Studio. Two hundred fifty people were seated in the Banquet Room, after which the party journeyed to the Studio.

Nearly 500 Alumni and friends assembled in the spacious Disney Theatre, where the program of the evening was conducted.

President Harry Farrar gave a short welcoming speech, followed by Bob Bawbell who, in turn, introduced Jacques Roberts, assistant production manager of the Disney organization. Mr. Roberts gave a very interesting and informative talk on production and procedure in the picture business. Following this, three "shorts" were portrayed on the screen, illustrative of their work.

Kenneth Brier, assistant manager of the Disney camera department, gave an interesting talk on techniques of art, color and camera. The party then adjourned to the property room where exhibits were displayed.

NEW YORK CHAPTER

On November 8, the New York Chapter of the Caltech Alumni Association held a dinner and social meeting at the Hotel Holley. Fifty-six members were present, including Dr. Sorensen, Dr. Untereiner and Dr. Houston.

Geoffrey Smith, managing editor of "Flight" and "Autocar" and director of Iliffe Publications of England, spoke on jet and rocket propulsion, giving particular emphasis to the robot bombs now being used against England. He also gave many interesting facts concerning the development of the gas turbine and jet-propelled aircraft.

The officers of the New York Chapter for the coming year are: James A. Davies, '35, president; Clyde R. Keith, '22, vice-president; Evan A. Johnson, '38, secretary-treasurer; George S. Lufkin, '29, director; Clifford Burton, '40, director; Harry St. Clair, '20, ex-officio president.

PERSONALS

1921

PHILIP S. CLARKE has recently been transferred from the Oleum Refinery to the Wilmington Refinery of the Union Oil Company, where he is now refinery manager.

1922

DWIGHT DEGNAN is assistant conductor and music contractor for Silver Theatre, Burns and Allen and Sherlock Holmes radio shows.

MAJOR JOHN E. SHIELD writes that he is "touring France this year, with Germany on my itinerary this winter or next year."

DALE J. MEIER has been commissioned at the Marine Corps Base, Quantico, Va. He is undergoing advanced officer's training before assignment to a combat unit or a technical school for specialized training.

COLONEL DONALD SHUGART is in charge of officer reclassification of the Headquarters Third Air Force at Tampa, Fla.

1923

DR. L. M. MOTT-SMITH is with Johns Hopkins University with O.S.R.D.

BASIL HOPPER was recently promoted to the newly-created position of vice-president in charge of manufacturing, Union Oil Company of California. Mr. Hopper has been with Union Oil since graduation from Tech.

JOHN R. NORTH is assistant electrical engineer for the Commonwealth and Southern Corporation at Jackson, Mich.

1924

ED LAYTON is project engineer for the Fluor Corporation of Los Angeles.

1925

PAUL NOLL has been transferred from chief engineer, plate department, to project engineer, Consolidated Steel at Maywood, Calif.

CAPTAIN TRACY L. ATHERTON, group intelligence officer, is camping out on a tropical isle with the Marines in an area where there is little action. His portrayal of the feminine population there is definitely without glamour.

1926

JOHNNY MICHELMORE is Northern Division engineer for the Southern Counties Gas Company, Glendale, Calif.

1927

TED COMBS has had a recent promotion to that of colonel. He stopped in at the Institute on a recent trip to Pasadena, after which he was to return to Camp Claiborne, La.

W. A. MINKLER was recently appointed application manager for air conditioning of the Westinghouse Electric Elevator Co., Jersey City, N. J.

LIEUTENANT RAYMOND PERRY is now commanding officer of the Navy V-12 unit at Flagstaff, Ariz. Previously he was commanding officer at the Navy V-12 unit, North Dakota State Teachers College at Minot, N. D.

KENNETH BELKNAP sits at his desk (Belknap & Belknap Insurance Agency) writing policies, when he's not out working for Pi Alpha Tau or giving a helping hand to the Alumni Association.

1928

RUSSELL J. LOVE was promoted to assistant vice-president of the Southwest Welding & Manufacturing Co., Alhambra, Calif. He also retains title of chief engineer.

RALPH CUTLER is the chief engineer of the Los Angeles plant of Western Pipe and Steel Company.

HERB Van der GOOT is a lieutenant (j.g.) at the University of Arizona, Tucson, Ariz.

1929

KENNETH KINGMAN is now superintendent of lube oil operations at the Oleum Refinery of the Union Oil Company.

HAROLD HUSTON is chief estimating engineer for the Southwest Welding Company, Alhambra, Calif.

LIEUTENANT-COLONEL BILL MOHR is now stationed at Fort Jackson, S. C.

1930

JOSEPH FOLADARE is the father of a daughter born on October 17 at the Huntington Hospital, Pasadena.

G. W. READ is a field engineer with Western Electric Company, New York.

GORDON S. MITCHELL is in command of a mobile signal motion picture unit in the South Pacific. During his photographic missions over the islands, he witnesses quite a bit of actual combat both on the ground and in the air. He has flown several missions over enemy territory and photographed their bivouac areas and outpost positions from 300 feet in a cub plane—exciting to say the least.

LIEUTENANT-COMMANDER HARRIS K. MAUZY received his promotion in the Naval Reserve in March of this year. He was married in San Juan, Puerto Rico, in August, 1943.

NATHAN WHITMAN is an engineer in charge of structural testing, Avion, Inc., Vernon, Calif.

1931

LIEUTENANT RAY LABORY, U.S. N.R., has been transferred to the Naval Ammunition Second Nct. Depot at Seal Beach, Calif.

1932

CARL LIND has been promoted to Lieutenant in U.S.N.R. and has been transferred to Camp Parks, Calif.

LIEUTENANT GORDON BOWLER, U.S.N.R., is an instructor in electrical communications at the Harbor Building School, Massachusetts Institute of Technology.

COLONEL BILL SHULER had a very harrowing experience by being buried alive by an exploding bomb in France, while commanding a combat unit of engineers in General Hodges' First Army. He was rescued and escaped with injuries which required hospitalization. Colonel Shuler, who was awarded the Silver Star and the Bronze Star for heroic achievement under fire in Normandy, has been with the First Army since D-Day.

DR. HALLEY WOLFE is with Electrical Research Products, Inc. in Hollywood, a division of Western Electric Co. He is the father of a son, Michael Jay, born the latter part of August.

JOHN V. CHAMBERS recently has been transferred to Industrial Indemnity Co., San Francisco, Calif.

CHARLES W. JONES, since September first of this year, has been doing consulting engineering work.

1933

FRED H. DETMARS has recently been commissioned a second lieutenant in the Signal Corps at Fort Monmouth, N. J.

DR. E. RUSSELL KENNEDY has been in China for seven months doing research work on automotive fuels for the 14th Air Force, having been transferred from chemical warfare for that purpose. He has recently received his major's oak leaves. At his home in Long Beach, a new son awaits his arrival.

1935

G. M. SMITH is a field planning engineer with Western Electric, New York.

BRYON M. INMAN was made engineering supervisor of the El Monte plant of the Du Pont Company, electrochemicals department, in July. He was formerly a project engineer.

JAY C. TAYLOR is a captain in the Air Corps, stationed temporarily at San Juan, Puerto Rico. He expects to return to Florida in November or December to join his wife and nine-months old baby girl.

1936

DR. SHERWOOD K. HAYNES is assistant director of the Harbor Building School and instructor in electrical communications at Massachusetts Institute of Technology.

MAURICE SKLAR is back in the Gulf Coast division of the Shell Oil Company, Inc., after two years in Illinois and Michigan as field seismologist. His present location is Rosenberg, Texas.

1937

WARREN FENZI is an ensign, U.S. N.R., in the Seabees. Prior to entering service, he was with Phelps-Dodge at Morenci, Ariz.

GEORGE DORWART is now located at the Dominguez field office of the Union Oil Co.

WALTER L. MOORE has been awarded the Collingwood Prize for Juniors from the American Society of Civil Engineers for a paper on his work at the Caltech Soil Conservation Laboratory. At present he is research engineer at Lockheed Aircraft Corp.

BRUCE MORGAN proudly announces an heir, Stanley Bruce, born in July.

1938

JACK DOUGHERTY, a geologist for Phillips Petroleum Company at Amarillo, Texas, was visiting at the Institute, coming back to California on a business and vacation trip.

C. W. CLARKE is chief production engineer at AiResearch, Phoeniz, Ariz.

DONALD S. TAYLOR was made laboratory supervisor in charge of research and control laboratories, El Monte plant of the Du Pont Co., electrochemicals division.

LIEUTENANT (j.g.) ALLAN K. ALSAKER, U.S.N.R., is assistant to the resident inspector of naval material at Winston-Salem, N. C.

NED FRISIUS is now employed by the University of California in connection with a traffic test being run on a portland cement concrete test track at Hamilton Field, Calif.

1939

LIEUTENANT (j.g.) HERBERT STRONG, U.S.N.R., is engineer officer in the Carrier Aircraft Service Unit located in the desert, which services Helldivers and related planes.

PHILIP DEVIRIAN is an engineer for the Food Machinery Corporation of Los Angeles.

LIEUTENANT CHARLES F. CARSTARPHEN is superintendent of ships in charge of repair at Pearl Harbor Navy Yard.

MAJOR BOB WINCHELL is assistant A.A.F. liaison officer to the Signal Corps Ground Signal Agency now located at Bradley Beach, N. J.

LIEUTENANT MATTHEW TYLER having been on active duty in the South Pacific for 14 months is now at the Naval Air Station at Pasco, Wash.

1940

DUMONT STAATZ is in the Medical Corps of the Army, at the present time in training at Letterman General Hospital in San Francisco.

FIRST LIEUTENANT JONAS E. HITE is still in the South Pacific. He has been overseas since May 1942.

LIEUTENANT (j.g.) ROBERT S. NEISWANDER has been transferred from Patuxent River Naval Air Station where he had been an engineering test pilot, to the Postgraduate School at Annapolis for two years of postgraduate work in radio and flying.

O'DEAN ANDERSON is at present in Venezuela, South America, for Morrison-Knudsen Co.

ROBERT L. WELLS is working at Westinghouse research laboratories in the mechanics department on Navy problems.

FRANCIS MORSE is still with Goodyear Aircraft, designing airships for the Navy.

FRED BRUNNER is with the Bahrein Petroleum Co. on a refinery project overseas.

1941

DR. ROBERT A. BECKER and Dorothy May Wilkins of Piedmont, Calif., were united in a formal ceremony at St. Paul's Episcopal Church in Oakland on September 20. Dr. Becker is connected with the applied physics laboratory at the University of Washington.

RALPH C. MANINGER writes that he is doing some very interesting work for the Navy at the U. S. Navy Underwater Sound Laboratory at Fort Trumbull. The work is in connection with fundamental research in underwater sound. He also proudly mentions little Margaret Elizabeth, his daughter of 18 months.

DR. HORTON (GUY) STEVER has been in England for over a year on a technical mission for the radiation laboratory at M.I.T. and expects to return home any day.

WILLIAM CHAPIN has accepted a new job in the process department of Fluor Corp., at Los Angeles.

JOHN C. SMALL is attending Marine Officers School at Quantico, Va.

LIEUTENANT (j.g.) M. V. EUSEY, JR., U.S.N.R., is flight radar officer on the U.S.S. *Tripoli.*

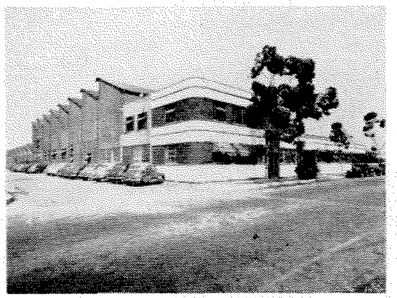
CAPTAIN HERMAN W. SMITH, JR., has been overseas nearly two years, serving in the Air Force as a meteorologist in such places as North Africa, Sicily, Italy and Sardinia.

1942

LIEUTENANT W. F. CALLAWAY, U.S.N.R., a recent visitor on the Campus,

The KINNEY GROUP

1800 Men serving their old customers -- welcoming new



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Meehanite Metal and Grey Iron Castings—1 ounce to 30 tons. One of the largest and most modern foundries on the Pacific Coast. Meehanite castings are made in the following processes — General Engineering Meehanite (including pressure resisting), Chemical Resisting Meehanite, Wear Resisting Meehanite, and Heat Resisting Meehanite

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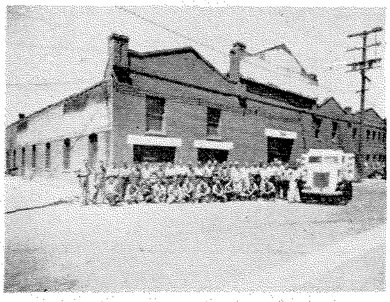

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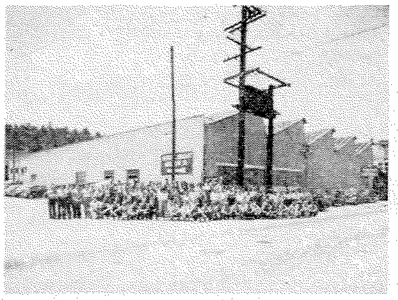

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Over 400 employees specializing in production machine work, dies, jigs and fixtures; adequately housed in a plant covering an entire block. An organization capable of undertaking many types of manufacturing problems. Hydraulic presses, large planers and large milling machines permit work of all sizes.

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A plant devoted exclusively to wood and metal patterns. The first step in a service of "From blueprint to final product." A jobbing pattern shop which assures the pattern being entirely acceptable to the foundry and delivered when promised. You are invited to inspect the work and equipment of this plant at any time.

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LOS ANGELES

Wendell H. Kinney, Stanford, '21
Roland T. Kinney, Stanford, '22
Bryant E. Myers, Cal Tech, '34
C. Vernon Newton, Cal Tech, '34

Forbes W. Jones, Cal Tech, '35
Leonard Alpert, Cal Tech, '43
B. R. Ells, Throop, '10

This Christmas the war trains will roll —as usual

Out on the line, December 25 will be as busy as any other day on the Southern Pacific. It won't be much of a holiday for our men at the front, either. The enemy doesn't stop shooting just because it's Christmas.

This Christmas Day and night we shall keep the war trains rolling, just as we have kept them rolling every day and night since Pearl Harbor.

To all the travelers and shippers we served this year —our heartfelt thanks for your sympathetic understanding of our problems, and the cheerful way you accepted the inconveniences of wartime transportation.

In sending you the Season's Greetings, we join with you in praying that next Christmas will be celebrated in a world at peace.

S·P

The friendly Southern Pacific

has been on active duty with the Fleet in the Pacific for the past two years.

HENRY ROESE, Seaman Second Class, joined the Maritime Service last June and now is taking radio training in New York.

ENSIGN RALPH M. WILLITS is attached to a PT Squadron in the Southwest Pacific and is finding plenty of excitement.

CLIFF HOAGLAND was presented with a baby girl, Susan Carol, recently.

ADRIAN MAYER has received an honorable discharge from the Army and will enter the September class at Northwestern University School at Chicago.

JOHN RUBEL is the father of a son born in October, named Robert. John is still with General Electric at Schenectady, N. Y.

ENSIGN H. GEORGE OSBORNE says he ran across T. G. ATKINSON, '42, (Lieutenant j.g.), at the Officer's Club on one of the Marshalls. He says the island is very desolate, without a single living tree.

CORPORAL WILLIAM BLUMENTHAL of the U. S. Army Air Corps has been reported missing in action in the South Pacific since May, 1944. His home was in Los Angeles.

WILTON STEWART was visiting at the Institute before reporting to his new assignment at Fort Benning, Ga.

ENSIGN J. B. FRANZINI, U.S.N.R., is now stationed at the Tactical Radar School in Hollywood, Fla. Before entering the Navy, he taught hydraulics at the Institute. In October he was awarded *in absentia* the professional degree in civil engineering.

ROBERT A. SPURR announces the birth of Stephen Josiah on October 16, 1944.

ROBERT GREEN is on the staff of the British Colonial Service located at Joss, in the middle of Africa. He has a two-year appointment, effective as of last July.

1943

RAY TEDRICK is a junior engineer for the Pacific Alaska Division of the Pan-American World Airways in San Francisco, Calif.

DEANE N. MORRIS is now in the Marine Corps, having finished training at Parris Island, S. C., and Camp Lejeune, N. C. Prior to entering the service, he had been with Bell Aircraft of Buffalo where he was in the flight research department and also taught aerodynamics.

ROBERT ROSS DAVIS and Geraldine Miriam Spence exchanged vows recently in the Wee Kirk of the Heather at Glendale, Calif.

1944

FREDERICK B. ELY was commissioned an ensign last June at Plattsburg, N. Y. At present he is gunnery officer on an L.S.T. which is now in waters of the South Pacific.

ROLF D. BUHLER and Mary Noll of Pasadena were united in marriage recently. Mr. Buhler is engaged in aeronautical research at the Institute.

JAY R. BORDEN was recently commissioned a second lieutenant at the Eastern Signal Corps training center, Fort Monmouth, N. J.

HANS NEUTZEL is now employed by the California Division of Highways at Los Angeles.

GEORGE F. SMITH received his commission as Ensign, U.S.N.R., late in summer and was ordered to Washington, D. C. to do engineering work in communications.

R. E. ALLINGHAM has an ensign's commission and is an engineering officer on an L.S.T. in the Mediterranean Area, but expects a transfer soon to other waters.

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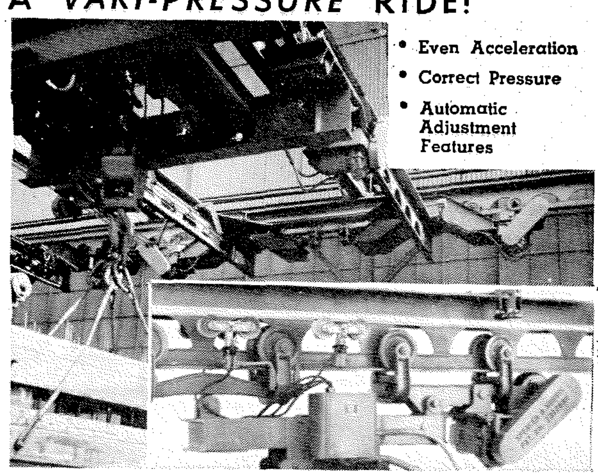

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