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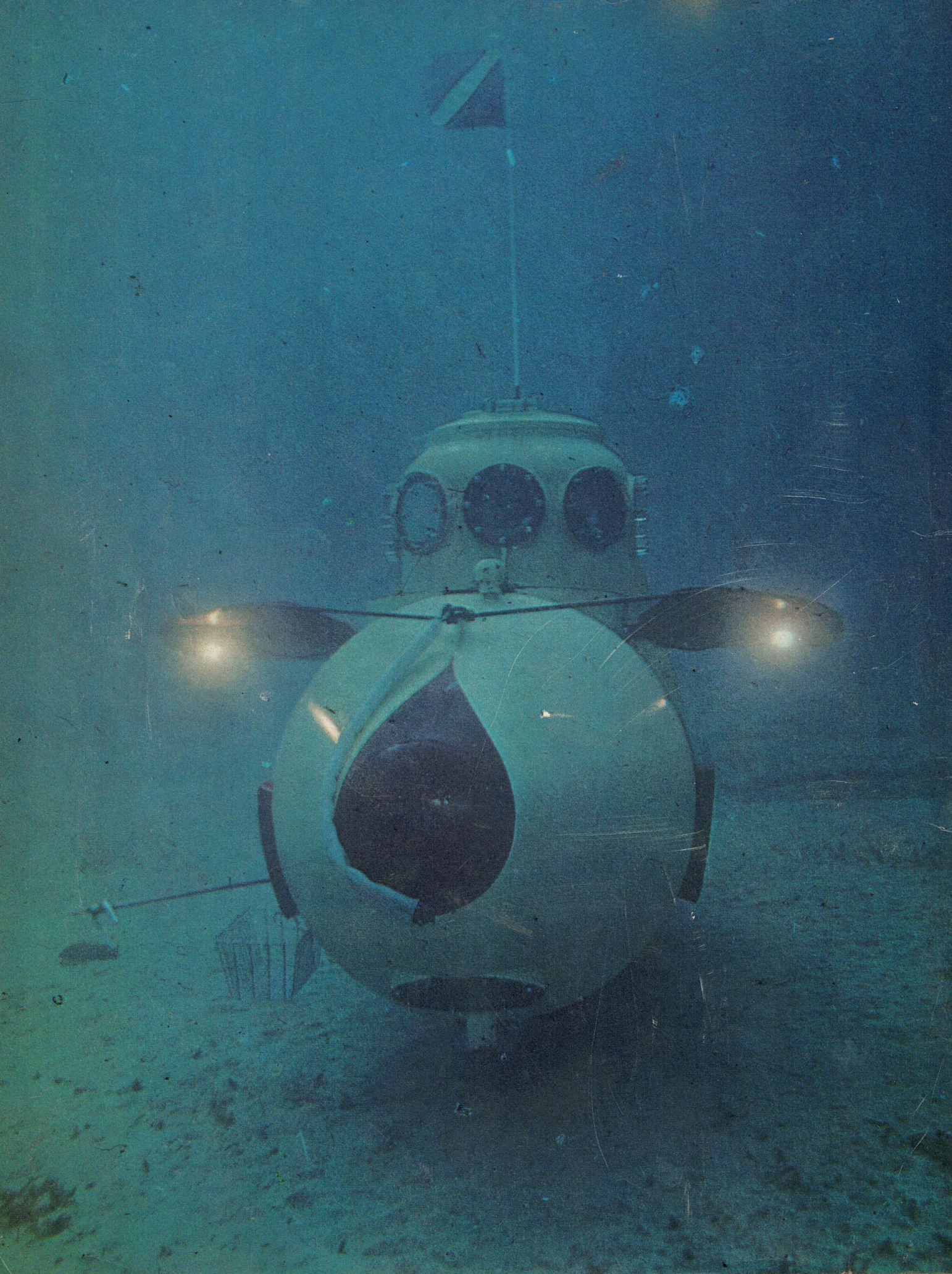
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PHOTOS

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MULEGE' • AND MANY MORE •



 AROUND 1900, anyone who entertained the idea of flying around in an airborne vehicle was regarded as a nut. A few "nuts" here and in Europe made Aero-planes that actually flew. They drew a big crowd. People jumping off high buildings was commonplace, whereas a plane crash was rather spectacular. Even though it was a good show, no one took Aero-planes seriously.

It wasn't until big industry got interested that things really began to jump. One industrialist said, "If there are nuts around that want to fly, we'll make Aero-planes." Other industrialists soon said, "If Alexander Ajax is making planes, we'd better make them too." What happened was a big game of industrial leapfrog and now we're headed for the moon.

Submarine technology followed almost the same course except that it started sooner and took longer. I guess man naturally figured that it was easier to imitate a fish than a bird, so there were divers long before there were flyers. When the mechanical age began, a few "nuts" built submersibles and they, too, put on a good show. Most were 100 percent submarines: that is, they went down and stayed there. That part of the show was poor, but at least it was something new to talk about. At first no one took subs seriously either, but by 1902 there were enough around to inspire Rear Admiral A. K. Wilson, V. C., Controller, Royal Navy, to say, "Underwater weapons they call 'em. I call 'em underhanded, unfair, and damned unEnglish. They'll never be of any use in war and I'll tell you why; I'm going to get the First Lord to announce that we intend to treat all submarines as pirate vessels in wartime, and we'll hang all the crews." With that kind of thinking, Captain Cousteau should be burned at the stake. He predicts that one day man will make his home in the sea and swim around like a fish. A lot of people think *he's* nuts and I'd say so too except that I don't want to be quoted later — when it happens . . .



# SUB

by Dick Anderson (nebulous hero)

The importance of submarines in warfare is history, and since the war individuals here and there have been building backyard subs that usually stay in the back yard.

Things are changing, though; important people are beginning to take a new look at the sea. Nearly every major industry in the country is knee deep in submarine projects. Several are building manned deep subs. I don't know if they'll ever accomplish anything, but there's one reassuring thought; "You Can Be Sure If It's Westinghouse." This may turn out to be another game of industrial leapfrog and who knows where it will end.

But let's talk about a little two-man sub that is working right now. It didn't cost \$207 million, it wasn't created in a vast industrial complex, it isn't Government-subsidized, directly or indirectly, but it dives, it does its job well and its services are in constant demand.

The sub belongs to Martin Toggweiler. He bought it from a young man named Doug Privitt, a tool and die maker by trade and a spare-time engineering genius. About five years ago Doug decided to make a two-man submarine. He didn't have any special reason, he just wanted to. This wasn't a backyard sub. Doug made it in the machine shop where he worked. First he got a length of 36-inch steel pipe and welded ends on it. Then he added a conning tower, thick plexiglas ports, ballast chambers, 24-volt elec-

tric motor, rudder, diving planes, a bunch of gauges, valves and fittings, and painted it yellow. When he got it finished, it looked like a sub. It even acted like a sub. About that time Doug's understanding wife said, "Honey, that's really a wonderful sub you built, but what are you going to do with it?" Also about that time Doug ran into Mart Toggweiler who had been a Naval Architect at Philadelphia during the war. Mart recognized the fact that Doug's sub was no toy, and realizing its potential, he bought the sub and formed a submarine services company, Hydrotech. Doug is part of that organization.

After a few familiarization runs at Catalina, Mart put the sub to work. It became an invaluable tool for pipeline inspection because it could cover miles of submerged pipe and give a constant report of the conditions by means of the wireless communications system. Even more important, company engineers could go down in the sub and see conditions firsthand. This was a major breakthrough for any company concerned with underwater installations.

The sub has now logged hundreds of working dives. Mart has set the maximum working depth at 350 feet although the sub itself has been tested to 500 feet. The 6- and 7-inch plexiglas ports are given a sceptical eye by some critics, but Mart and Doug have tested them to 1,500 feet. As tough as the sub is, Mart admits that things may begin to pop a little at around 1,000 feet; hence the 350-foot limit.

I first saw the sub at Catalina two years ago. Mart was undaunted by my somewhat stereotype reaction, "Mickey Mouse." "Try it," he said. After a five-minute instruction period, I descended into St. Catherine Cove.

The sub is easy to operate. Two valves are opened to flood the external ballast tanks. Under water, final trim is established by adding or ejecting water from an internal ballast tank. I pushed the switch to FORWARD and headed for deep

*continued on next page*

water. At about 80 feet I spotted the rusting hulk of the motor ship Valiant. As I "flew" over that old wreck I couldn't help but think of the many shivering hours I had spent digging around in there. This was more like it. I parked on the poop deck and changed places with Doug who was in the observation position. We took off again and headed for the bow which rests at 100 feet. Doug spotted a big Angel Shark on the bottom and said this would be a good test for the manually operated mechanical arm. As he eased the sub along side, I pushed out the arm and grabbed the shark firmly around the tail. It was a strain for me to hang on to my end, but that 40 pounds of flailing disapproval was more than an adequate test of the arm. I released the shark and he slid back into the bottom just as though nothing had ever happened—a very phlegmatic fish.

Doug guided the sub around the fantail of the Valiant and headed for shallow water. I watched the stern mooring line from Mart's boat come into view as Doug threw the switch into reverse and brought us to a stop. After getting an "all clear" from the surface, he blew air into the ballast chambers and up we went. I was sold . . . and dry!

With that introduction I was anxious to see some real working dives, and I have. In the past two years I've witnessed many of Hydrotech's operations — everything from pipeline inspection to body recovery.

One of the toughest jobs to date was a submarine power cable inspection for the Bonneville Power Administration. This 25,000-volt cable, the world's largest, delivers power to the Orcas Power and Light Company in the San Juan Islands. It is in two sections and runs from near Anacortes, Washington, four miles across Rosario Strait, hops over Decatur Island and continues on another two miles to Lopez Island. Rosario Strait drops down to a depth of 320 feet, and Lopez is a mere 50 feet.

The cable had been in service nearly 15 years when J. V. Lamson, Seattle Area Engineer, and J. D.

Rohlman, Substation Maintenance Superintendent decided that it needed a complete "routine" inspection. They had used scuba divers to check the cable, but because of swift tidal currents, inspection was carried out near the shore in protected areas and in shallow water. Since the cable was mostly covered in these areas, the reports were inconclusive. As Lamson stated, "The need for diving up to 300 feet in short periods of slack or near-slack current made the submarine best adapted to this limited schedule—covering miles of travel along the cable."

The Bonneville Power Administration contacted Hydrotech and entered into a contract for the inspection. Toggweiler, in turn, hired me to be safety man and handle the topside communications. Being a safety man for a submarine may require a little explanation, so I'll explain. The sub is small, just 13 feet overall. It can attain a maximum positive buoyancy of 700 pounds. If it got hung up on a line or cable, with a breaking strength of 705 pounds, there might be problems. This hasn't happened yet and it probably won't, either, because the sub is designed "snagproof." But when you're working under water it's best to be prepared for any eventuality.

Mart, Doug, and I arrived in Anacortes well briefed on the job but not really knowing what to expect of the water conditions. They weren't good. The current was swift, with a visibility of five feet at the surface. Satisfactory completion of the job would have been impossible had it not been for the forethought and planning put into this operation by the men of the B. P. A. Besides tide tables, they had tidal current charts, bottom profile charts and two manned transit stations on shore which radioed their readings to our support boat, the M. S. Vision. Visual presentations at the on-shore station could be immediately referred to a chart and the exact position of the sub displayed with reference to the cable. The accuracy of this system was proved over and over. Even when we were operating two miles

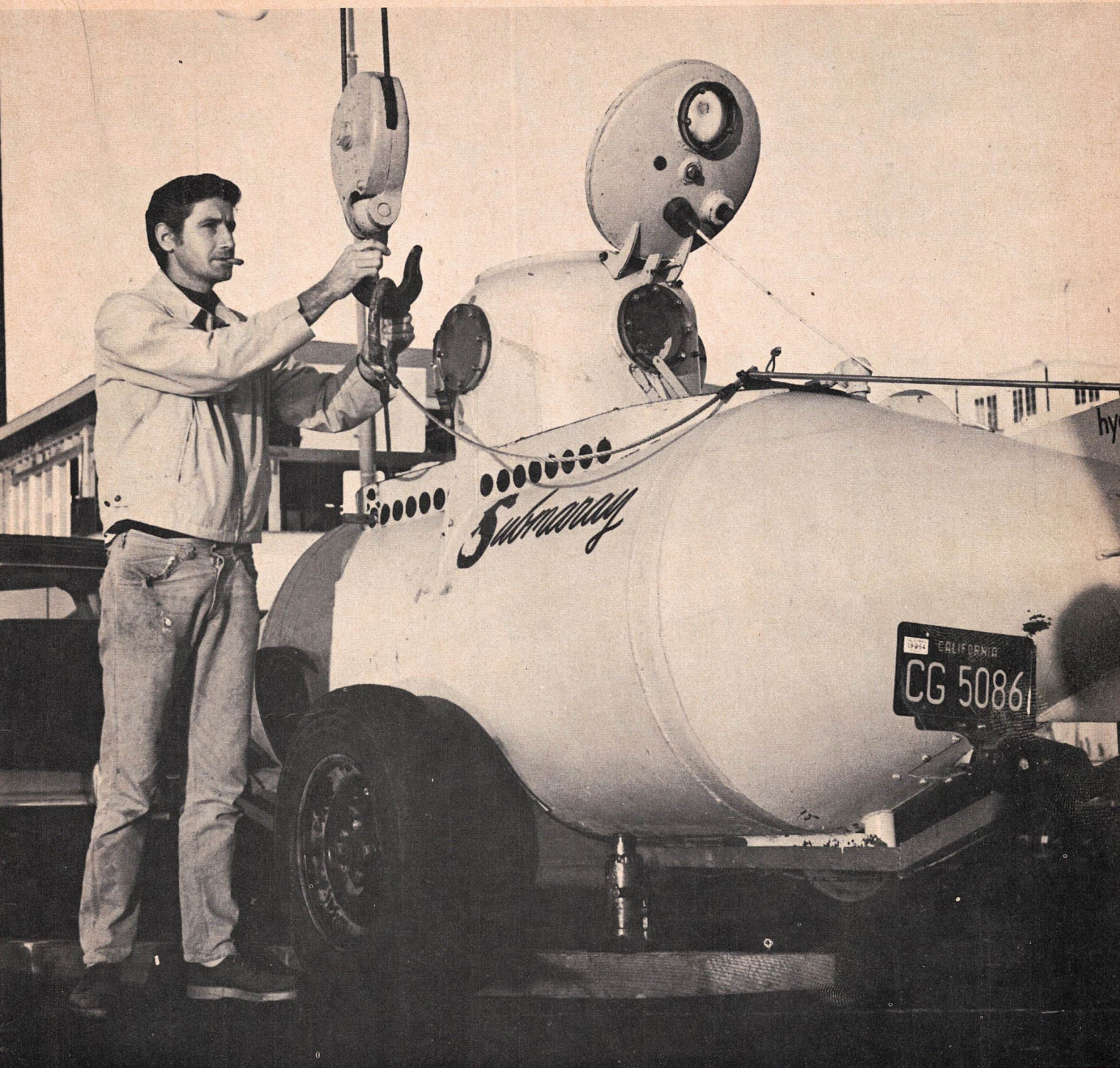
from shore, the descending sub never missed the cable by more than 100 feet, and this due to the current. At depths greater than 100 feet, there was total darkness, and even with the sub's powerful bow light, visibility was limited to a few feet. Poor visibility plus the fact that the cable was partially buried, would have prevented a systematic survey had not the B. P. A. been foresighted enough to mount a 60-cycle pickup on the sub with a meter inside that registered when it was in the vicinity of the cable, buried or not.

My job was easy. I just stood on deck and talked into the mike. Down below, Mart and Doug kept up a running report, and on the surface the total conversation was fed into a tape recorder. The sub is equipped with its own tape recorder for detailed reports.

It was never necessary for me to dive into Rosario Strait to extricate the sub, and I'm certainly not sorry. At one point, off Decatur Island, Doug's report came over the underwater communications set something like this — "... depth is 285 feet ... hey! what's this? Looks like a bomb ... keep going, Mart." For a moment the only sound coming from the speaker was the hum of the sub's motor and gyrocompass. "Cable looks good, armor intact, ... Mart, look at the size of those octopuses, bodies two feet across ... cable looks good ... WOW! there's 2 five-foot sharks swimming under the bow light ... Mart, watch out for those wires! UP! UP! UP" I stood sweating in my wet suit, supposedly from the heat, but it was a cool day — 290 feet, bombs, giant octopuses, sharks, wires, ice water, and total blackness.

Then Mart and Doug sent up word that the sub was hung up. I thought a simple "Adios" would be nice. But the report continued, without emotion, "rocky bottom ... cable looks good."

The sub's two-way, transistorized, ultrasonic communication system proved to be a great help. Not only did it give perfect voice reproduction, but since it incorporates a directional transducer on the



Our hero hitching up the Submoray for the launching.

surface, we were able to pinpoint the exact direction of the sub. The strength of the signal from the sub registers on a voltmeter so it is even possible to make a reasonable estimate of distance.

This communication system was manufactured by Ross Laboratories of Seattle, and Mr. Ross was on hand to watch some of the opera-

tion. Everyone was amazed by the performance of his unit except him. I don't know what his secret is, but it's the only unit I've seen that really works good and continues to do so.

On the fourth and final day of the inspection, Don Rohlman, Maintenance Superintendent, descended in the sub with Mart to personally check an area of particular interest.

To aid him in preparing his report, he used the sub's tape recorder and later referred to his own running account of the cable and bottom conditions.

Using a miniature submarine to check a power cable was an unusual innovation for the B. P. A. As Mr. L. A. Moore, Seattle Area Manager, *continued on next page*

stated, "We use helicopters nearly every day to patrol some 9,000 miles of high-voltage transmission lines, but this is the first time the Bonneville Power Administration has ever tried to use a submarine to report the condition of a cable."

Did this operation represent a worthwhile expenditure to the Bonneville Power Administration? The answer to that is best summed up in a letter I received from Joe Lamson, Area Engineer.

Subject: San Juan Service, Cable Inspection, August 13-16 inclusive.

"This inspection enabled us to evaluate the condition of the cable

throughout its length instead of having our information limited to a few points along the line. We needed to know if the cable was resting on a rocky or sandy bottom and if it had been subjected to damage by ship anchors. The bottom condition was determinable by the submarine, and reports were communicated to the surface vessel as the inspection progressed. No anchors or other marine tackle were found on the cable. We noted the excellent teamwork of the submarine crew which included your own participation in support of the various diving operations. The inspection was a success..." *END*

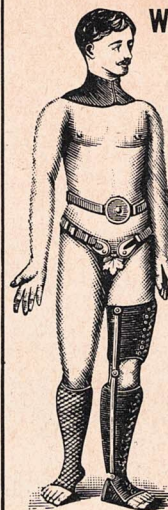


## DIVE'S GLOSSARY TO UNDERWATER PUBLICATIONS

<p><b>Mondo sommerso</b> Italian monthly</p> <p>Via Ravenna 8, Rome, Italy 1 Year (12 issues) \$9.60</p>	<p><i>Pescaport</i> Monthly Italian National Underwater Spearfishing Review</p> <p>Galleria Mazzini, 7-1, Genova, Italy 1 Year (12 issues) \$5.00</p>
<p><i>neptun</i> Monthly for German-speaking countries</p> <p>Franckh'sche Verlagshandlung Pfizerstrasse 5-7 Stuttgart, Germany 1 Year (12 issues) \$7.50</p>	<p><i>Delphin</i> German monthly</p> <p>Munich-Unterhaching Burgm.-Prenn-Strasse 8 1 Year (12 issues) \$6.00</p>
<p><i>L'avenire SOUS-MARINE</i> techniques et exploration</p> <p>French, bi-monthly magazine 10 Rue de la Bourse Paris 1e, France 1 Year (6 issues) \$5.00</p>	<p><b>DIVE</b> NEW ZEALAND'S SOLE DIVING PUBLICATION</p> <p>Underwater Magazine 1 Year (six issues) \$2.00</p> <p>Monowai St., Wellsford Northland, New Zealand</p>
<p><b>TRITON</b> Bi-monthly Journal of the British Sub-Aqua Club</p> <p>25 Orchard Road Kingston-on-Thames Surrey, England 1 Year (6 issues) \$2.20</p>	<p><b>CRIS</b> "Magazine of the Sea" Spanish monthly</p> <p>Via Layetana 30, 2º H Barcelona, Spain 1 Year (12 issues) \$4.00</p>

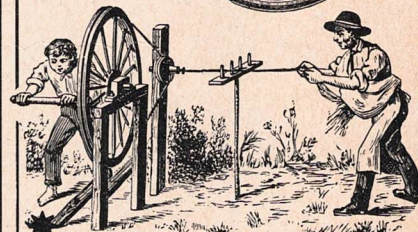
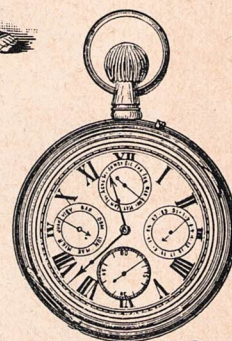
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\* MASKS & SNORKELS  
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\*  
DIVING WATCH  
12.99



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