try to attach a cable that could be used with a surface winch to pull Alvin up. Though it weighs only 10,000 pounds on the bottom, Alvin, full of water, would weigh almost five times as much in the air. Winches on the Chain, officials said, would be able to lift it, if they get the chance.

Even with a prompt recovery, engineers face a time-consuming job of refitting Alvin. "It may take several months, at least, to repair the equipment damaged by water," says Dr. John Schlee, a U.S. Geological Survey marine geologist who has been working with the vessel. Because Alvin's hatch was open, he says, "it did not implode from sea pressures, but a lot of electrical equipment may be ruined."

In any event, more Alvins are on the way. At its Groton, Conn., yards, home of most of the U.S. nuclear sub armada, General Dynamics Corp.'s Electric Boat division is building a pair for the Navy. One will reportedly go to Woods Hole via the Office of Naval Research, while the other is destined for the Navy's Advanced Underwater Test and Evaluation Center. The new craft, expected to be completed next month, will have two maneuverable claws instead of the downed Alvin's one, will be two feet longer and capable of 500 feet of additional depth.

PLUTO

Reconciling the mass

There are two ways to calculate the mass of a planet. One is from the effects it has on the motion of nearby planets. The other combines its size with the density of the matter that is known or assumed to make it up.

In the past, when the two methods were applied to the planet Pluto, they led to widely disparate results. Now a new analysis of the motions of Neptune by a team from the U.S. Naval Observatory brings the two figures reasonably close to each other.

Motion effects, observed on a known planet, have sometimes begun the search for an unknown one. The identification of Neptune in 1846 resulted from studies of the motion of nearby Uranus.

In Pluto's case, motion data were not sufficient to predict its position, though they did lead astronomers to suspect its existence. The actual observation came from an intense search of the sky rather than preknowledge of its position.

Earlier analyses, one based on the motion of Neptune and the other on Uranus and Neptune, had given Pluto masses of 0.91 and 0.82 earth masses respectively. (One earth mass is 5.98×10^{21}—nearly 6,000 billion billion—metric tons.)

Such a mass would give to Pluto a density of at least 40 grams per cubic centimeter.

The problem with this figure has been to decide just what Pluto could be made of to be so dense. Earth's density is only 5.5 grams per cubic centimeter. Iron, which makes up a large part of the earth, has a density of 7.8. A solid lead Pluto would have a density of 11.3; solid uranium, the heaviest stable element, would give only 18.95.

On the other hand, if one took the size of Pluto—best recent measurements give an upper limit of 6,400 kilometers for its diameter—and assumed that the composition of Pluto, like that of other terrestrial-sized planets, was similar to the earth's, the mass of Pluto would be only 0.13 times that of the earth.

But, Drs. R. L. Duncombe, W. J. Klepczynski and P. K. Seidelmann point out in SCIENCE, for Nov. 15, the orbits of Neptune that have been used in the older calculations did not really predict the motion of the planet very well. Each of these had been carefully fitted to observed positions of Neptune up to the time of calculation, but when it was compared to positions of Neptune observed since then, discrepancies—up to 1/720 of a degree—in Neptune's position in orbit appeared.

The Naval Observatory group therefore decided to make trial calculations of the motion of the five outermost planets using supposed values of Pluto's mass that ranged from 0.18 to 0.91 earth masses, to see whether one of them would give a better fit to Neptune's motion for all positions observed since 1795. One of the difficulties in making such a calculation is that all these observations represent only about 70 percent of a single Neptunian orbit.

The best fit was found with Pluto's mass equal to 0.18 earth masses. If Pluto has the same density as earth, this figure would require it to have a diameter of 7,200 kilometers. If the observed figure of 6,400 kilometers is taken as accurate, then Pluto's density must be at least 1.4 times that of the earth, or 7.7 grams per cubic centimeter, a much more plausible figure than 40.

Though the figures have been brought a good deal closer together, the end is not yet. "Further refinement," the three astronomers conclude, "of the value of the mass of Pluto and the elements of the orbit of Neptune must await completion of a systematic discussion of the observations of Neptune now being made at the Naval Observatory." ◇

THE NEW FEMINISTS

Equality, not protection

Mrs. Friedan: not laughed off.

After several years of limping along behind minority groups, women are making a strong bid for job equality.

Fed up with years of watching men win promotions they think should be theirs, factory women are fighting both unions and employers in the courts of half a dozen states. The outcome will determine whether old state laws limiting the hours and conditions of female employment are still valid. Industry has used these laws as reason for not promoting women. Ironically, the laws were enacted in the first place to protect women workers.

The drive by factory women reflects stirrings of a larger feminist movement given new life by the Civil Rights Act of 1964. The act prohibits job discrimination on the basis of race, national origin or sex. But while the Government acted immediately to implement the racial provisions, those dealing with sex were treated with something less than seriousness.

"The minute sex got into the act, it was treated as a joke," says Betty Friedan, author of "The Feminine Mystique" and president of the National Organization for Women. "No one intended doing anything about it. Sexual discrimination was the only kind of discrimination still considered moral, or at least fashionable."

Nevertheless, the legislation provided a focus for female discontent and complaints began pouring into local offices of the Equal Employment Opportunities Commission. They equal and some-