IMPROVED HYDROGRAPHIC INSTRUMENTS.

A set of hydrographic chart-engraving machines, intended for use in the Hydrographic Office in the Imperial Japanese Navy, identical with those made by Queen & Co. for the United States Hydrographic Office and the United States Coast Survey, have just been completed at Philadelphia. The instruments are the invention of Vincent Le Comte Ourdan, who was for nineteen years engraver in the United States Hydrographic Office, where, by his inventive and executive ability, he created the Section of Mechanical Engraving, of which he was chief until his recent resignation for the purpose of going to Japan to deliver and install a complete set of the chart-engraving machines.

There are now in use in the United States Hydrographic Office two sets of these machines, and while they do not engrave quite one-half of the entire chart, they have, according to the official report of the Hydrographic Office, trebled the output of charts. The machines, of which there are six, consist of a sounding-engraving machine, a combination of tinting and border-engraving machine, a border subdividing machine, a border and scale-shading machine (which also engraves the United States Hydrographic Office symbol of mud bottom), a compass-engraving and lettering machine, and a multi-point divider. Our illustrations represent the sounding machine, the compass machine, and the lettering machine.

The sounding machine is 10 feet in length by 4 feet 6 inches in width; its great length permits the original drawing and the plate to be engraved to be placed side by side on the table. The positions of the soundings are transposed from the original drawing to the copper plate by means of a cross-head which travels north and south, carrying two carriages which travel east and west, each in an opposite direction to the other. The one overplaying the drawing carries a stationing-point, which is always in contact with the surface of the drawing; the other carries the engraving mechanism and a set of patterns, which are engraved on a circular disk mounted on top of said carriage. At the lower part of said carriage is a universal joint through which passes an engraving tool long enough to reach from the plate over the pattern disk.

The position of the sounding desired to be engraved is obtained by moving the cross-head north or south and the carriages east or west until the stationing-point is over the first figure of the sounding to be engraved. The pattern disk is then rotated until the proper numeral is brought to the index point directly in front. The engraving point, which is heavily weighted, is then lowered to the plate, and the upper end is made to follow the channel of the engraving pattern, thus cutting the numeral in the copper plate.

This operation is repeated until all of the soundings are engraved. The depths of the lines are regulated by the amount of weight on the engraving point.

The size of the figure engraved is regulated by raising or lowering the universal joint. To compensate for the shrinkage or expansion of the drawing, the stationing-point has a movement independent of the engraving point, and as the engraving point travels north and south or east and west, the stationing point is moved in the reverse direction by its independent movement, thus distributing the small error, due to shrinkage or expansion, over the entire chart so that at no one point is it noticeable.

The compass machine consists of an annular base, on which rotates a tool-carrier for engraving compass roses, and another tool-carrier for lettering the same. The base is oriented on the plate in proper position, and a true north compass consisting of a circle of 360 degree lines, and inside of that circle a circle of 128 lines representing the mariner's points. After this is engraved, the compass is set to the desired magnetic variation, when another degree circle and mariner's-point circle, both at the magnetic variation, are engraved inside of the true compass.

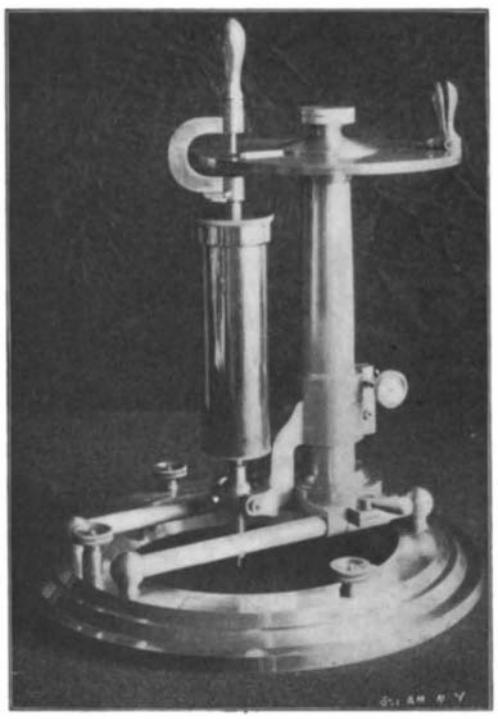
The compass engraving mechanism is then moved from the base, and the lettering mechanism substituted. This mechanism operates in exactly the same manner as the sounding machine, except that it only engraves in circles instead of straight lines, as in the case of the former.

Messrs. Queen & Co., Philadelphia, have been commissioned to supply a set of these machines to the German government, and expect to equip the hydrographic offices of the principal countries of the world with complete sets.

A popular woolen fabric much worn in England, a tweed, has caused a tuberculosis scare in England. It seems that it is made in little cabins by peasants, among whom consumption is very prevalent.

A New Plan for Protecting Trees Against Cold.

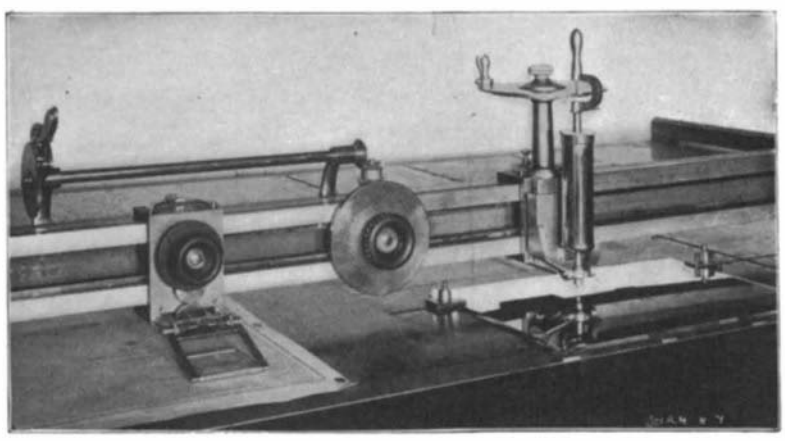
Mr. J. F. Tucker, of Brooksville, Fla., has devised a most ingenious apparatus for protecting trees or vegetation against the cold. He found by observation and experience that tender vegetation on the south shore of a river, lake or other body of water, usually escaped the blighting effect of frost, while similar vegetation on the north side had been badly hurt, and even killed. The orange groves in Florida, which have enjoyed



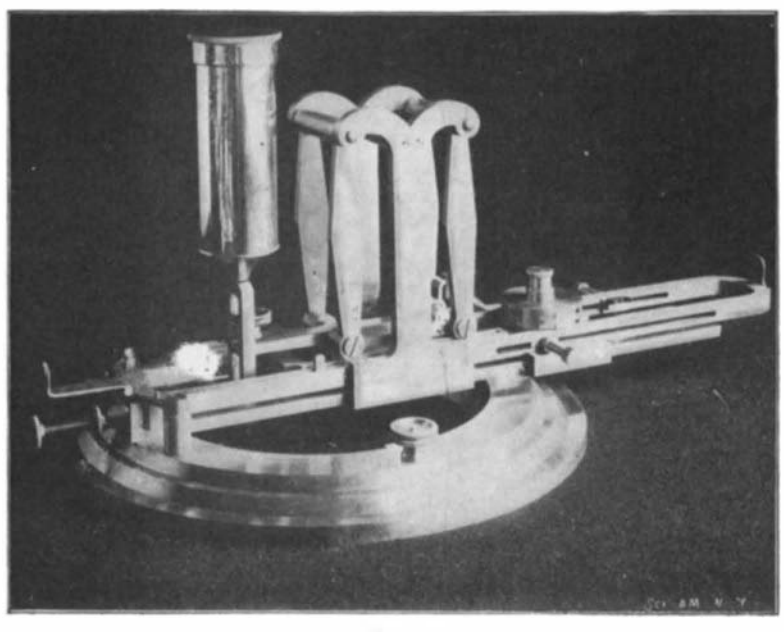
THE LETTERING MACHINE.

the greatest immunity from frost, have been, in nearly every case, protected by a body of water to the north or west of them, or, better still, both north and west, the directions from which the severest cold in Florida usually comes. In Florida the deep-water rivers and lakes are commonly fed by springs which contribute to the heat treasured up from the long summer months, so that when a cold spell comes the air is brought in contact with the body of water at a relatively high temperature—say 66 to 70 deg. F. This contact of the cold, frosty or freezing atmosphere with this body of warm water causes a cloud of fog or vapor, sometimes quite dense, to rise from the surface of the lake or river, and completely envelop the locality south and east of it, thus securing immunity to orange groves or vegetable gardens that may happen to be there, and groves are so located with the specific purpose of securing the protection assured by such conditions. This vapor by condensation makes sensible the latent heat supplying the favored locality with both heat and moisture and raising the temperature to such a degree as to give more or less immunity from damage by frost or freezing. According to a bulletin published by the Weather Bureau, the heat given off by the condensing of vapor is enormous. The condensation of enough vapor to make one pint of water will evolve enough heat to raise more than five pints of water from the freezing to the boiling point. Mr. Tucker's invention proceeds upon these principles, and it comprises means for making an artificial fog in the orchard or over the ground to be protected, in which means he employs, as leading elements, one or more artesian wells for supplying water, pipes for distributing the water through the grounds, heat appliances for warming the water, pumps for forcing it to its destination, compressed-air appliances and numerous spray-nozzles distributed through the orchard for spraying the warm water and converting it into a protecting blanket of vapor, in connection with other details. The essentials in his process are heat and moisture, applied in such a way as to make sensible the latent heat as an adjunct to the heat he actually applies. For water he favors artesian wells, as they are usually of a high degree of temperature and remain unchanged by the cold of winter.

In the absence of wells, he seeks the warmest water he can find in the deepest parts of rivers, lakes, etc. In Florida he has found artesian and other deep wells to range from 72 to 84 deg. F., and he considers that 65 to 70 degrees can be depended upon for the deep water of rivers and lakes, his object being in all cases to obtain a water naturally the warmest. His experiments have been made with the natural water alone, and he believes that where the temperature of the well runs high it will, for anything but the severest weather, be found sufficient; but, in order to make his system a protection against any cold that may come to the fruit belt, he utilizes the intense heat of compressed air, by means of which he believes he can raise the temperature of these arid warm wastes to 100 and 110 deg. or more. Mr. Tucker's device comprises a system of pipes with spray nozzles extending at close intervals and distributed throughout the entire field, a well or other source of water supply, pumps for energizing the water, and an air compressor discharging its air in a heated condition directly into the water for the triple purpose of promoting the flow of water, for heating the same, and for admixing a gaseous medium therewith to promote its atomizing at the discharge nozzles. The pipes running through the orchard are from 1 to 2 feet underground, and are connected with the spray-nozzles at suitable intervals. Valves serve to control the mains. For ordinary purposes two outer guard-lines will probably be sufficient, since nearly all Florida cold spells are accompanied by winds of considerable velocity, and these winds will sweep the vapor through the grove as it does the mist or fog that rises from a body of water to north or west of a grove, and he finds he can, by heating the water, bathe the grove in a hotter and moister atmosphere than is done by a lake or river. Cisterns are provided which are to be housed and tightly covered so as to hold the heat, in order that the water may be stored therein from one to three hours, with the air-pump working at full capacity in order to be sure of sufficient heat to overcome the severest cold that may ever occur in the orange section, thus making the grower perfectly secure. The apparatus can be arranged to be used for irrigation when desired, and one of the cisterns can be used for the preparation of the emulsion for treating the trees for scale and other insect enemies. When the hot compressed air issues from the ejector into the artesian well, it mingles with and is carried along by the water in its travel to the spray-nozzles. This not only insures the utilization of all of the units of heat in this air, but it also, when issuing at the spray-nozzles along with the water, forms an atomizing blast and produces a fine comminution of water and produces the physical characteristics of fog.



REAR VIEW OF SOUNDING-MACHINE.



THE COMPASS MACHINE.

A New Vineyard Pest.

The vineyards of northern Portugal have been attacked by a new pest called the Maromba disease. Samples of the trees attacked have been sent to the Royal Gardens at Kew, London, for investigation, and the result of these examinations shows that the disease is caused by a fungus, the *Rosellinia necatrix*, which has the peculiar power of attacking the roots of almost every kind of plant with which its mycelium comes into contact. The remedy is an application of carbon bisulphide near the roots of the affected trees.