NEW MAGNETIC OBSERVATORY AT SITKA, ALASKA

By Wm. D. Patterson

The Sitka Magnetic Observatory was established by the United States Coast and Geodetic Survey in the year 1901, and was placed in operation on January 1, 1902. A seismological observatory was added in 1904. The buildings of the Observatory were constructed on a small plot of ground, reserved by the Government for this purpose, located about 150 yards outside the residential section of the town, which was then a small fishing village. Since the beginning of work on the Naval Air Base near Sitka in 1937, the town has rapidly increased in size to a present (1940) population of nearly 2,000. Early in 1938 it was recognized that the extension of private building construction, containing large amounts of magnetic materials, toward the Magnetic Observatory

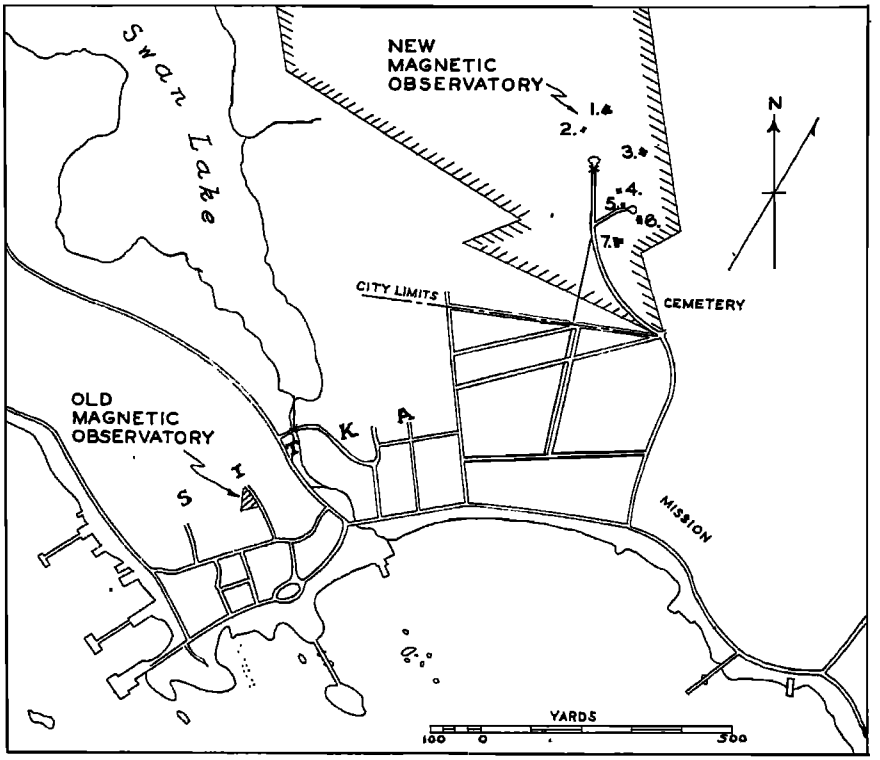

FIG. 1—MAP SHOWING LOCATIONS OLD AND NEW SITKA MAGNETIC OBSERVATORIES

1. VARIATION-BUILDING
2. ABSOLUTE BUILDING
3. TEMPORARY VARIATION-BUILDING
4. SEISMOGRAPH-VAULT
5. GARAGE
6. ASSISTANT OBSERVER'S QUARTERS
7. OBSERVER'S QUARTERS

would soon render the observations worthless, and steps were initiated to move the Observatory to a more suitable location.

Fortunately, the United States Coast and Geodetic Survey was able to obtain the abandoned experimental farm of the United States Department of Agriculture, which site, it was ascertained, would remain undisturbed for many years, and which proved to be excellent for the purpose. The site consists of 110 acres—about six acres cleared and the remainder in woodland—located just outside the city limits. Locations for the magnetic observatories were selected after a magnetic survey of the area. These locations were selected at a sufficient distance from the boundaries of the tract so that future construction outside the tract cannot affect the magnetic observations.

A special appropriation by Congress in the late summer of 1939 permitted work to begin on the construction project. By that time the extension of private construction closer to the buildings of the old observatory made haste in the construction on the new observatory imperative. Clearing, grading, road building, and demolition of useless buildings at the new site were begun immediately in September 1939 with the help of the Civilian Conservation Corps.

Since it was probable that the main buildings, which were to be constructed under Government contract, would not be completed before the summer of 1940, it was decided to construct immediately the magnetic absolute building and a temporary variation-building by hired carpenters under the supervision of Government personnel. These buildings were begun in October 1939 and were completed in January 1940. The construction of the seismograph-vault and the garage was then undertaken and these structures were also completed by hired carpenters and laborers.

The work done under contract consisted of the construction of the magnetic variation-building, the Observer's quarters and office, the Assistant Observer's quarters, the laying of sewer and water mains from the city limits to the quarters, and the electric wiring of the Observatory's buildings including the erection of poles and transmission-lines. Construction on contract was begun in April 1940 and was completed in September 1940. The final transfer to the new site was completed by the end of September 1940.

Transfer of base-line values—This work was accomplished by R. E. Gebhardt, Observer-in-Charge, who will probably prepare an article on this phase of the work when the final station-differences are available. Briefly, values from the original absolute observatory at Sitka were transferred to a marked station on the site of the new Observatory. This marked point, designated *EXPER-1939*, will serve in the future as an auxiliary magnetic station. This work was done early in 1939 before construction in the vicinity of the old site had seriously interfered with the magnetic values there. When the new absolute building was completed in January 1940, values were transferred from *EXPER-1939* to the new absolute pier. Absolute observations were begun in the new building in February 1940.

Triangulation—A small scheme of triangulation was extended to the new site from the basic coastal scheme of the United States Coast and Geodetic Survey. This triangulation was used for the determination of the true azimuths from the absolute pier to the mark and from *EXPER-*

1939 to its mark, for the orientation of the magnetic observatories in the magnetic meridian, and for the orientation of the piers in the seismograph-vault in the true meridian. In the magnetic variation-building true azimuths are permanently marked on brass plates which are secured to the walls of the instrument-rooms.

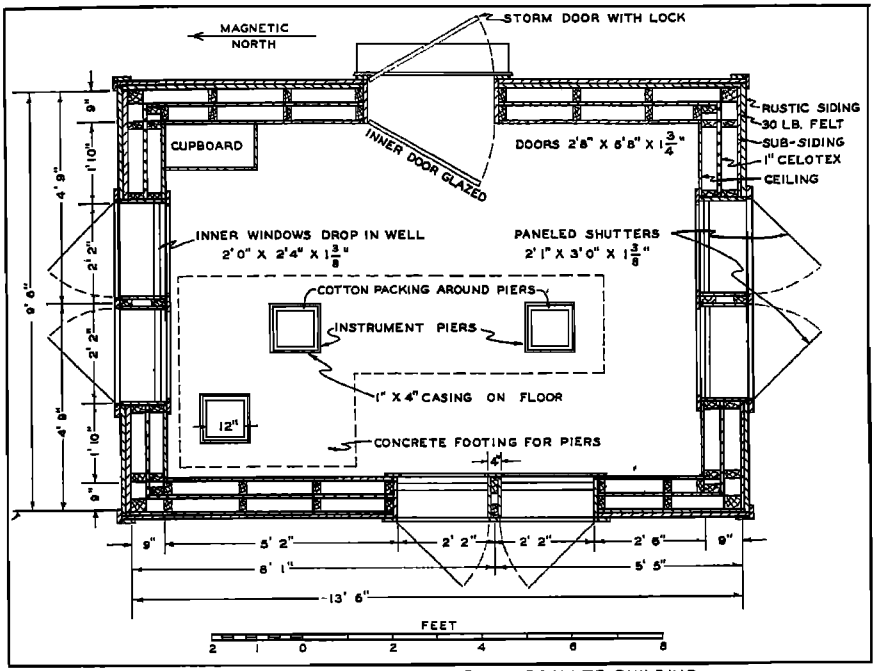

FIG. 2—FLOOR-PLAN OF MAGNETIC ABSOLUTE BUILDING

Magnetic absolute building—The floor-plan of this building is shown in Figure 2. Celotex insulation one inch thick was used in the walls as shown, Celotex one-half inch thick was used between the double ceiling layers overhead, and Masonite insulation one-half inch thick was used between the hardwood floor and the subfloor. During observations, the storm-door and the window-shutters are opened to provide light, and during observations for magnetic declination one window must be lowered for pointings on the mark. However, with the insulation provided, observations even in cold weather are made fairly comfortable by heat from a large lamp. At this high latitude, there are too few hours of daylight during winter months to complete observations and electric lights are provided in this building.

The instrument pier-foundations, and piers extending through the subfloor, are of concrete. Above the subfloor, each pier consists of four 12-inch cubes of white marble with a marble cap 13 inches by 13 inches by two inches; thus the top of each pier is 41.5 inches above the finished floor. There is a two-inch clearance around the piers where they pass through the floor, and cotton batten is lightly packed in this space.

The roof of the building is covered with asbestos-cement shingles, with ridge-roll, over 30-pound felt laid over one-inch by eight-inch tongue-and-groove sheathing.

Temporary variation-building—It was realized that the observations at the old magnetic variation-building would be affected by the magnetic materials in nearby construction long before the new magnetic variation-building could be constructed by contract at the new site. It was therefore decided to construct a temporary variation-building and to operate the instruments there pending the construction of the main building. The temporary variation-building was located at a sufficient distance from the site of the new magnetic variation-building so that the observations would not be affected by the construction tools used at the latter site.

Since it was intended to use this building as a workshop after it had served its purpose as a temporary variation-building, the design was a compromise between the two purposes. Non-magnetic materials were used throughout its construction. Insulation was provided by successive layers of Celotex with air-spaces between layers. Instrument-piers were of concrete below the floor, and above the floor of white marble blocks

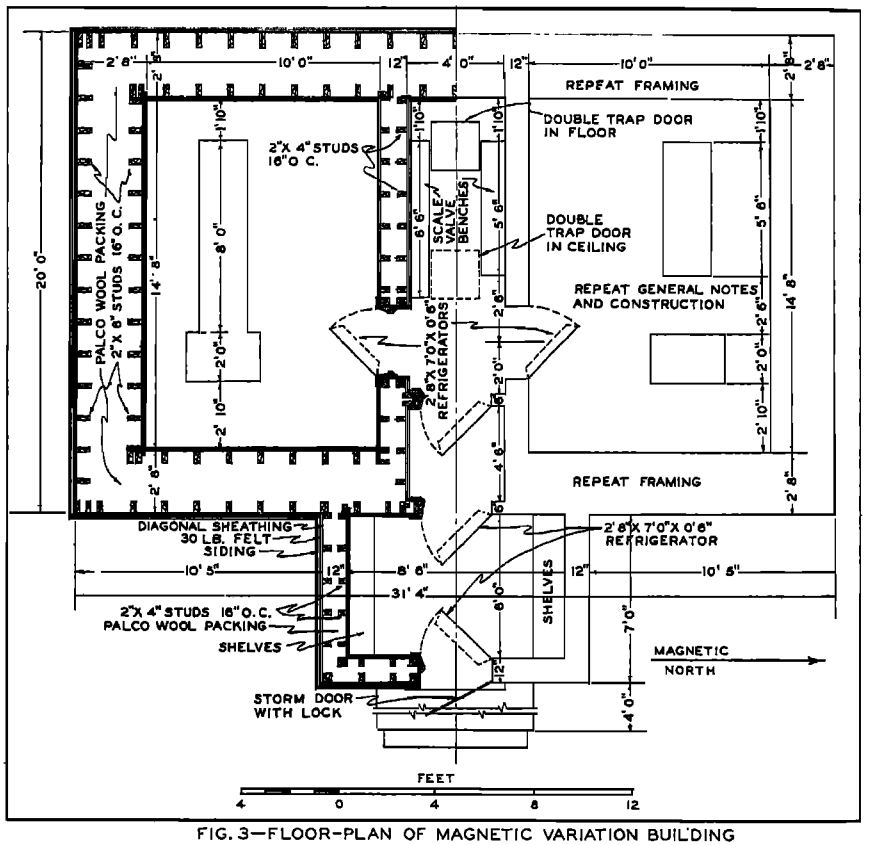

FIG. 3—FLOOR-PLAN OF MAGNETIC VARIATION BUILDING

surmounted by a white marble cap two inches thick. Window-frames were placed in the walls where needed for the workshop, but were covered with Celotex insulation. The thermograms obtained during the operation of instruments in this building proved that the insulation was as effective as desired. Instruments were operated in this building for some time after the magnetic variation-building was completed in order to permit the thorough drying of the piers in the latter building before use.

Magnetic variation-building—The floor-plan of this building is shown in Figure 3. Two instrument-rooms are provided, one being now used for the operation of a set of Eschenhagen instruments. The other room is intended for possible future installation of insensitive instruments of another type. Copper tubes extend through the walls between the instrument-piers and the scale-value benches for the measurement of distances. Small ventilators extend through the floor into the corridor and through the corridor ceiling into the attic.

The instrument-piers are of solid concrete below the floor-level. Above the floor, they are built up of Bedford limestone blocks surmounted by marble slabs two inches thick.

Palco Wool insulation was used in the walls as shown in Figure 3. There is also two feet eight inches of Palco Wool above the ceiling and beneath the floor. Palco Wool is made of shredded redwood bark and is sold in compressed bales of 100 pounds. It is considered to be superior to sawdust for insulation because termites will not touch it, it will not rot, and the insulation-value is higher. The cost of Palco Wool delivered at Sitka, Alaska, did not exceed the delivered price of clean, dry sawdust, which would also have had to be shipped from Seattle, Washington. The Palco Wool Company lent to the contractor a small electric-driven shredder to break up and distribute the baled material. This shredding process produces considerable dust which is irritating to nasal passages and gas masks or other means of protection must be used by workmen. However, in spite of this difficulty, it is considered that Palco Wool is easier to handle and install than sawdust.

Non-magnetic materials were used throughout the construction of this and the other magnetic observatories. All materials of doubtful non-magnetic qualities were tested before use.

Seismograph-vault—The floor-plan of this building is shown in Figure 4. The building was formerly used by the Department of Agriculture as a root-cellar, and it was modified by the Coast and Geodetic Survey for use as a seismograph-vault, for which purpose it was admirably suited. The building is set into the side of a low hill and, except for the front wall, is covered with earth. The roof is an arched concrete slab, eight inches thick, supported by reinforced concrete beams and posts, with two concrete ventilators extending through the roof and earth-cover. The floor is of concrete; partitions are of wood. Tile-drains extend around the building and beneath the floor.

The instrument-piers extend down to bed-rock which was found at a depth of from three to five feet below the floor. The piers are of solid concrete from bed-rock to the floor-level, above which they consist of Bedford limestone blocks surmounted by marble caps 72 inches by 48 inches by two inches. There is a two-inch clearance between the concrete floor and the piers, and this space is filled with dry, screened sand.

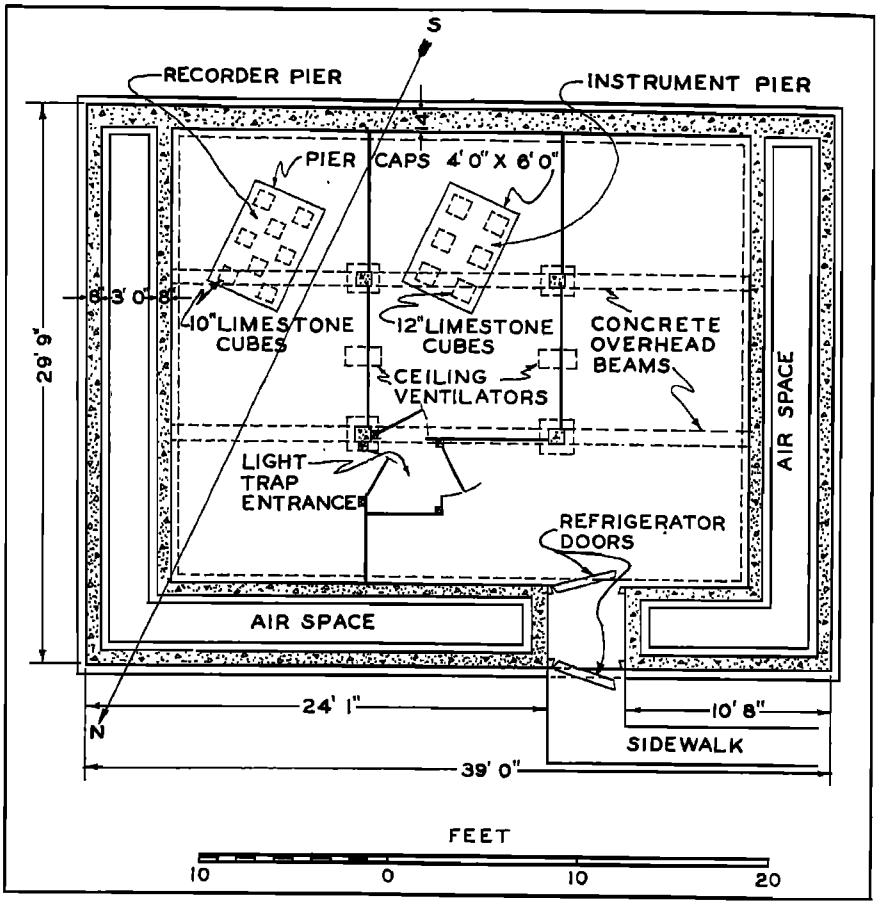

FIG. 4—FLOOR-PLAN OF SEISMOGRAPH VAULT

The present instrumental equipment consists of two Wenner horizontal-component seismographs. Microseisms are too large in this locality to permit the use of high-magnification seismographs. There is ample room in the vault for the installation of additional instruments if desired in the future.

Quarters buildings—These consist of the Observer's quarters and Assistant Observer's quarters. The Observer's quarters has an office wing in the rear and a dark-room in the basement. Both buildings are of wood-frame construction with reinforced concrete basement walls and floors. Roofs are covered with asbestos-cement shingles and ridge-roll, and asbestos-cement shakes are used on the sides. Rock-wool insulation is used in all exterior walls and between ceiling joists. Automatic oil-burning furnaces are used with forced hot-air circulation to the various rooms.

The office wing of the Observer's quarters has a floor-space 17 feet by 24 feet with separate lavatory. Storage-batteries with chargers, which

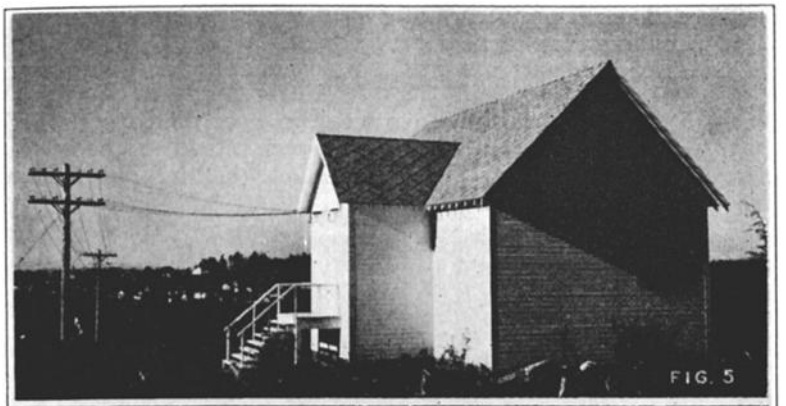

FIG. 5—MAGNETIC VARIATION BUILDING
FIG. 6—OBSERVER'S QUARTERS OFFICE WING IN REAR NOT SHOWN
FIG. 7—ASSISTANT OBSERVER'S QUARTERS

operate the instrument-lights of the Observatory, are located in the basement, and all instruments are connected electrically to a panel-board in the office. The master clock is also located here.

A two-car garage was also constructed at the new site. This is a plain, wood-frame building, with patent lift-overhead doors and with a gravel floor.

Costs—All buildings were constructed in accordance with Federal Specifications which require first-class materials and methods of construction. Building costs at Sitka were about double those for similar construction in the States.

UNITED STATES COAST AND GEODETIC SURVEY SHIP *Pioneer*,
Oakland, California, January 15, 1941