Subject: **Don Cruse**
Date: 5/13/2018 5:14:33 PM Eastern Standard Time
From: al_elderberry@yahoo.com
To: bcjohjax@aol.com

Here is printed history of our Microseismograph that Don wrote about. I also put one of my maps on the USS Hornet which my uncle was an original plank owner. I gave Don my station manual and he put it in our Weather history at Pensiacola fl
Al Berry

Sent from Mail for Windows 10

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7 Attached Images

Don Cruse

5/14/2018

U. S. NAVY MICROSEISMIC PROGRAM

Don Cruse, NWSA Historian

This is an initial description of a program that many of us never achieved familiarity with during our years in Aerology or Naval Weather Service. But for many years the Microseismic Research Program was an integral part of the service. Significant amounts of time and money were expended to find out if the seismograph could be employed in tracking areas of severe weather, primarily hurricanes and typhoons. Of course many of our NWSA members were trained and then assigned to microseismic stations. I hope that this brief outline of the program can be expanded by adding personal accounts of duty in the program. My thanks to Al Berry for pointing out this omission in our historical records as published in The Aerograph.

The seismograph was invented more than 2,000 years ago to make permanent records of major earthquakes but these early instruments were never successful because of crude design and workmanship. It was not until 1841 that an instrument worthy of the name "Seismograph""was developed. Subsequent evolution has kept pace with other developments in the science of geophysics. (1)

In between earthquakes there are continuous vibratory earth motions termed microseisms. A group of geophysicists led by Father James B. Macelwane, SJ., believed that abnormal microseismic activity was caused by severe ocean storms. Fr. Macelwane initiated a research project at St.Louis University in 1938. Fr. Ramirez, S.J. ran the project which established the first tripartite microseismic station in the United States. This station achieved encouraging results during a severe September 1938 hurricane which moved northward along the Atlantic Coast and over Long Island. (2)

Captain Howard T. Orville, USN, then Director of the U.S. Naval Aerological Service, initiated a major research project in 1943 to determine the operational value of microseismic data to military forecasting. After years of work and experimentation with microseismic station locations, configurations, instruments and techniques, a network was in place. The network hub was Miami. Personnel were selected and trained at the Microseismic School on Marine Corps Air Station Miami, where the U.S. Fleet Weather Central was situated. Geophysicist Marion H. Gilmore was the primary instructor for the eight-week courses conducted during 1953. The skipper at that time was Captain Thomas J. Raftery, USN. (3)

Here is the description of duties for Navy Enlisted Job Code AG-7432, Microseismic Technician (circa 1949):

"Installs, operates and maintains microseismic equipment to detect and track storms; operates and uses horizontal seismometer, photographic recorder, reflecting galvanometer, resistance boxes, chronometers and photographic equipment to detect and track storms; maintains continuous photographic record of all ground motions, including earthquakes and microseisms; develops and maintains all photographic records; maintains log of operations and observations, including record of U.S. Naval Observatory time and chronometer rate; measures starting time of earthquakes; draws amplitude and period charts, tests accuracy of time control, calibrates seismometers, and inspects wiring of equipment; directs operation of tripartite station when required, making precision measurements of travel time difference of microseismic wave front as recorded by three instruments; calculates bearings of storm area and interprets microseismic records for meteorological data, and sends interpretations to main'weather office at prescribed hours."

The annual report of the NAVY Microseismic Research Project for calendar year 1952 states that much progress had been made in solving the problem of detecting and tracking severe tropical storms by recording changes in the amplitude and period of microseisms. Hurricane recording stations were then located at Miami, Whiting Field, Cherry Point, Swan Island and Jacksonville.. The report recommended additional stations and suggested optimum locations for them, to improve hurricane detection. Stations were later added at Puerto Rico and Bermuda. Eventually, typhoon recording stations were established on Guam, Yap, Koror, Truk and Okinawa, assisted by a microseismic station in Manila operated by the Philippine Weather Bureau.

The microseismic network proved its value in alerting forecasters to the existence of storm areas. Then other warning systems could come into play and evaluate the storm potential. Examples are reconnaissance aircraft, surface and upper air reports. This was of course prior to our exposure to modern, space-based, satellite observing systems. Each NAVY microseismic station submitted monthly reports (to _____); and here is an excerpt from a Guam report for July 1952:

"EMMA first started as a vortex about 500 miles south of Guam on 27 June. Microseismic amplitude at Guam started rising slowly on 28 June when EMMA was 385 miles SSW with about 50 knots of wind. The amplitude continued to rise until 30/0600Z when it peaked at 024mm with EMMA 560 miles SW of Guam with 90-knot winds. The amplitude then fell slightly and by 01/1200Z July again peaked at 025mm. EMMA was then located 960 miles WSW of Guam with winds 100 knots. July 2 saw EMMA passing over the Visayas in central Philippines and out into the South China Sea. While EMMA was over land Guam's amplitude fell to 020mm, then rose rapidly when the storm moved seaward. A peak of 044mm came at 04/1600Z July when EMMA was 1,650 miles away with winds 85 knots. Then amplitude began to decrease rapidly, reaching nearly normal on July 6 as EMMA passed inland over southern China."

The NAVY decommissioned its Okinawa microseismic station by 1952, leaving only Guam and the Manila stations operational in the Pacific region. By the late 1950s the program was terminated. (4)

Notes: (1) Marion Gilmore in Weatherwise, Vol. 2 No.4, August 1949

(2) ibid

(3) Alvin F. Berry, ex-AG2

(4) Zane Jacobs, AGC USN-Ret

and were so adjusted that a heavy truck could pass near it and no detectable earth movements reached the galvanometer, while a hurricane hundreds of miles away transmitted a significant wave pattern on the photo electric sensitive chart which turned on a drum in the main office vault. For a time, I was "traveling trouble shooter" visiting various sites and adjusting the "CDRX". An interesting assignment prior to taking over The Roos. Rds. P.R. Station.

The arrangement consisted (single station) of a horizontal seismometer mounted in a concrete base. The seismometer itself featured a pair of ALNICO 5 magnets between which was a suspended horizontally swinging pendulum. This pendulum housed a coil which when swung between the magnets generated an electrical current thence transmitted to the resistance box. The energy wave was transmitted a known distance to the vault to a galvanometer with a exceedingly fragile gold wire suspension supporting a small mirror. A beam of light arrived at the mirror, which in turn reflected onto the photo paper on a 24-hour drum. The operator would enter the drum room as one enters a photo lab (lights out) remove the chart and put it through a photo developing process, drying it then measuring the ampitude and periods of the wave forms of seismograms as well as any other notable variation of peaks and valleys on the chart. Of course a new chart was placed on the drum during this process.

As I recall, the Atlantic side of the Seismo network included stations at Cherry Point, N.C., Bermuda, Miami, Antigua, Puerto Rico, Swan Island and Guantanamo. The Pacific network I'm not familiar with, only that there was a station at Naha and the main base was Guam.

The project was shut down by ONR during my tour at Roos Roads and I shifted over to ComTen KSJU. Seismo was one of those "good duty" assignments usually independent duties. No one knew exactly what we were doing and we tended to intensify the mystery when possible as some places with weather offices hoped to retain our presence on their watch bills, but we were deep into research of course.

I recall when Paul Kubina went to Swan Island. The mode of transportation was by banana boat from Tampa. Some of the personnel names I recall include Kangas, Weir, Ferguson, Nadeau, and George Schultz.

In my estimation it was a shame that funding for the project was cut off just when really tangible results were obviated. It is my understanding that ONR wanted the project to "Go Operational" while Mr. Gilmore wanted at least another season of research. The "micro-ratio" technique of tracking storms certainly had merit though it would have been a supplement to Recco not a substitute. Unfortunately, satellites (allegedly) replaced Recco following my tour as flight meteorologist in VW4. We all know that was economy driven and USAF and NOAA continue in that important work.

As a final note, considering the advances in all sciences in the past 50 years, had Hurricane Seismology progressed into the exotic computer driven era of today what changes may have been wrought? What benefits accrued?

On reading the forecast discussion in NHC's web page one wonders how far actual prediction has come. "The storm was here, it is now here, and if it continues on the same track for a given period of time, it will be here." Not in any way short citing NHC but with the various computer models agreeing to vary or disagree given virtually the same input data, and probability forecasts based on extrapolation of an idea, we aren't too far advanced as of yet. We know where it's been and where it is but confound it, where is it going? (Refer Debby 2000) or of more significance, is it really in fact, by all definition, by slope, pressure, temp., wind field, etc. REALLY a hurricane? (Again Debby 2000)

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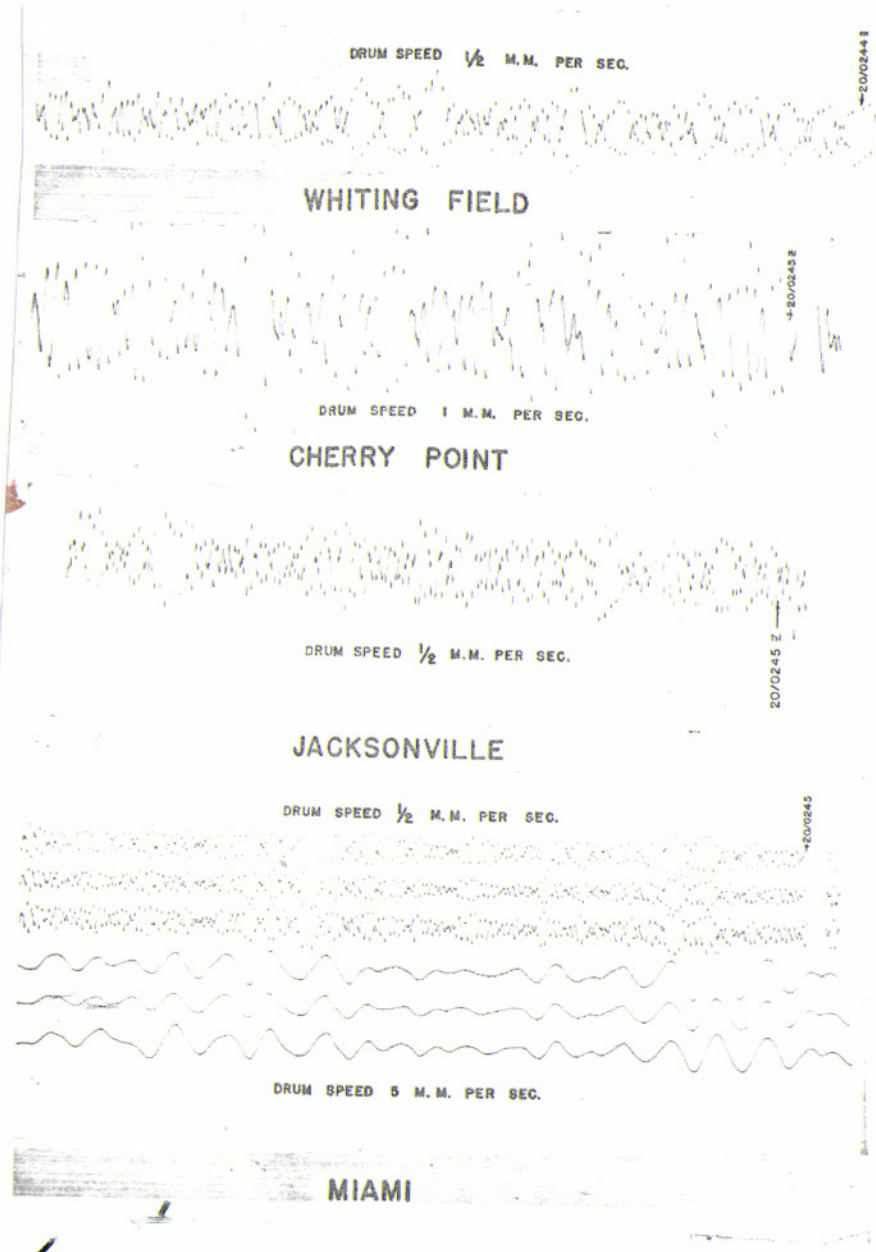
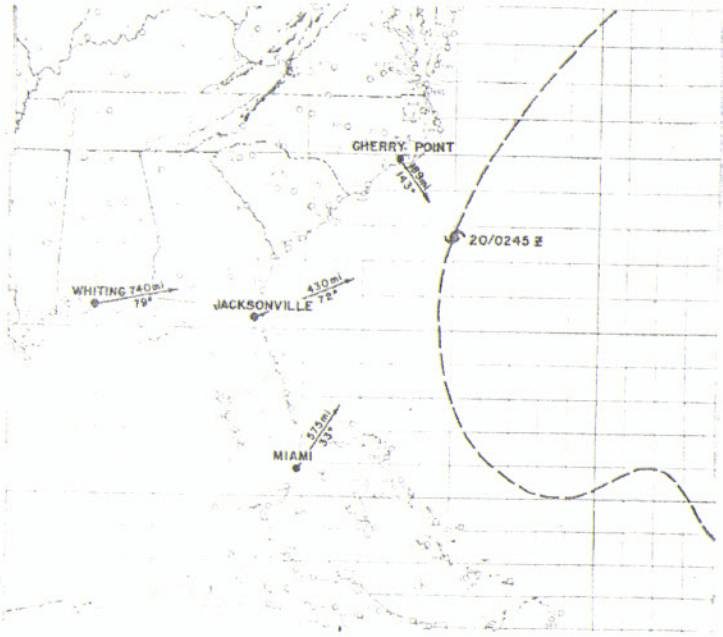
[1] "CDRX" Critical Dampening Resistance Ratio. Each seismometer was set to precisely filter out extraneous activity (by the current generated as the pendulum moved between the powerful magnets) and then run through a resistance box prior to reaching the galvanometer. Earthquakes were discernable and measured with results forwarded to UCGS Golden Colorado. Between careful adjustment of the magnets and cranking in the required ohms of resistance, the seismograph was dampened to the CDRX. This value was a formula devised by Mr. Gilmore and remains to me "secret". Try this at the CPO Club.

[2] Single Station. A microseismic station consisting of a horizontal Springnether seismometer mounted on a concrete base with a 1-mile length of conducting wire leading to a resistance box, thence to a galvanometer. The galvanometer had a mirror that moved laterally as the calibrated current fed into it. A photosensitive paper turned on a drum and was activated by a beam of light reflecting off the galvanometer mirror onto the slowly rotating drum. The drum and galvanometer were in a photo dark room of the building that in total comprised the "site" or "station". The station was equipped with an efficient photo developing system.

[3] Tripartite Station. A microseismic station comprised of three horizontal seismometers located in an equilateral triangle of 1-mile legs. Of course, then there were three galvanometers, etc. vice one. A tripartite station had the distinct advantage of clocking the exact time seismic activity crossed each leg seismometer, thus, giving direction from which activity was occurring.



MICROSEISMIC RESEARCH PROJECT



COMPARISON OF MICROSEISMS RECORDED SIMULTANEOUSLY AT FOUR STATIONS DURING AUGUST 1950 HURRICANE

Alvin Berry
1241 Citrus Dr.
Leesburg, FL 34788

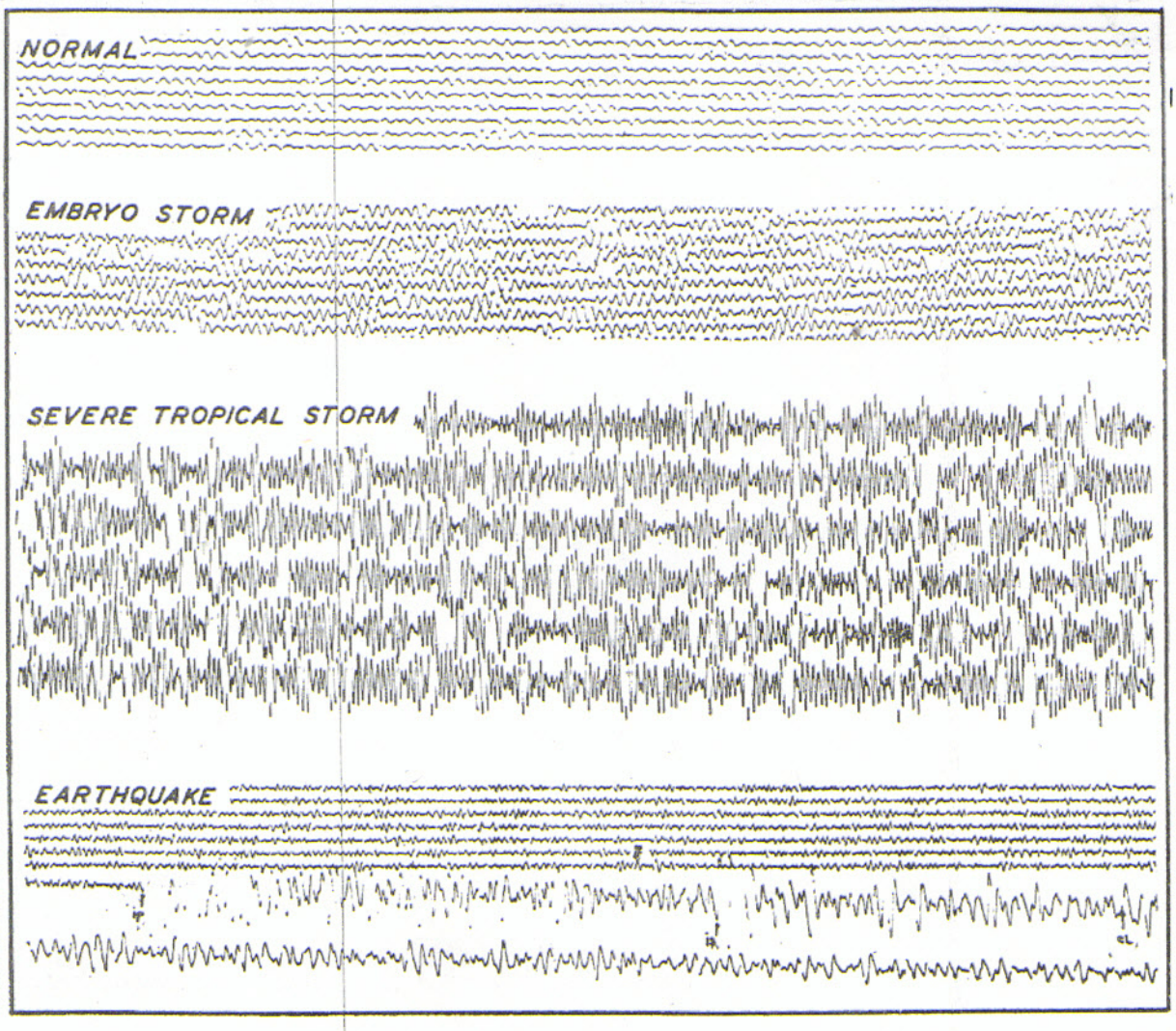
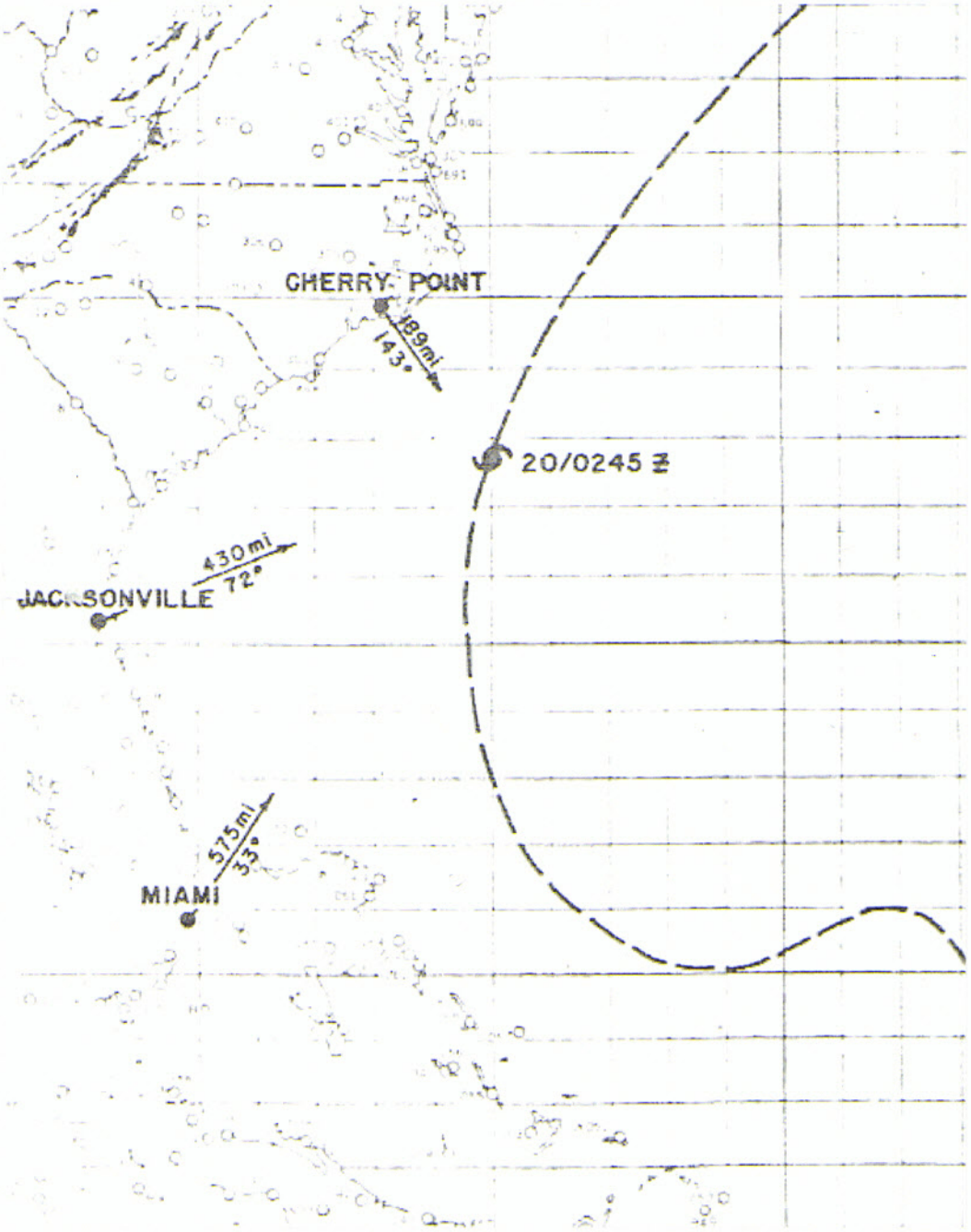


Fig. 1. Types of earth vibrations, showing a normal microseismic trace, microseisms increasing in amplitude due to an embryo storm, large microseisms caused by a severe tropical storm within range of the recorder, and a normal trace suddenly disrupted by seismic waves from an earthquake in Liberia, Africa (5,900 kilometers from the recording station in Puerto Rico).

Don Cruse

5/14/2018


CHERRY POINT
189mi
143°
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430mi
72°
JACKSONVILLE
575mi
33°
MIAMI

HORIZONTAL COMPONENT SEISMOMETER, Series - H

A Retaining Standard
B Boom
C Boom clamp screws and air jet
D Coi magnet support
E Magnification adjusting screw
F Damping magnet support
G Damping adjustment screw
H Boom centering scale
I Levelling screw for period adjustment
J Boom clamp bar
K Leveling screws for centering boom
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M Damping vane
N Level vial
O Hinge clamp plate

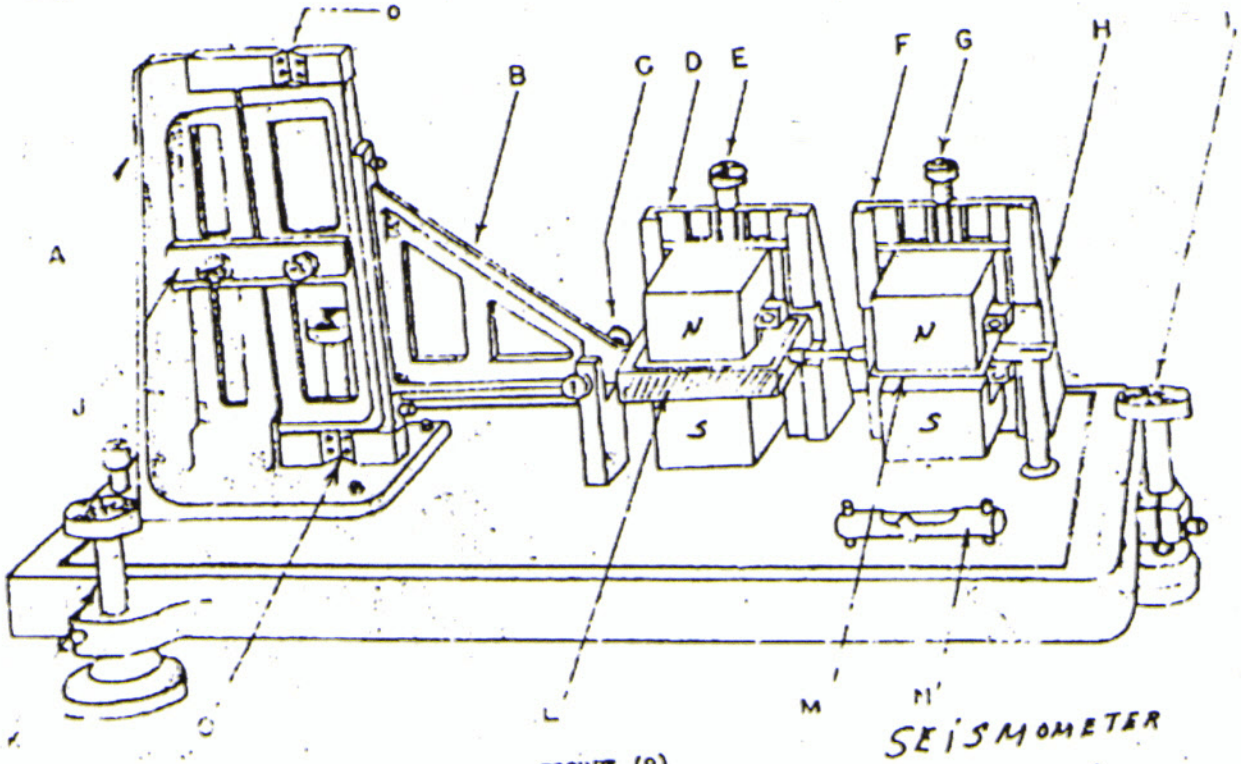

FIGURE (9)

(22)