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SUBJECT Developments at Laboratory for Geophysics (C)

Of Information: This report contains general information on research and development work conducted in the laboratories of the "Institut fuer Geraetebau!" (Institute for Scientific Equipment Construction) at the German Academy of Sciences in BERLIN, with special emphasis on the activities of the la 50X1-HUM for geophysics. Among the recent developments in the meteorological and hydrological fields are "Bordwetterhuette", a meteorological station for the remote

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control measurement and registration of meteorological data on board ships; "Grundwasserlot" (ground water plummet), a kdevice for the determination of the ground water level and the temperature of the water column; "Seehund", a hydrological universal measuring device; "Tauwaage" (dew scale), for the observation of the course of dew fall and related factors; "Viscosimeter" for the determination of the viscosity and temperature of plastics; "Calorimeter" for a range from minus 70° to plus 70° centrigrade; and "Silent Observer", a small meteorological station built into a buoy at sea with transmitter for the automatic registration and transmittance of diverse meteorological data, (last two items to be developed in 1958).

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REPORT

1. General

The "Institut fuer Geraetebau" at the German Academy of Sciences in BERLIN is engaged in the research, development and construction of scientific apparatus for the special requirements of the Academy. It is located in temporary premises within the compound of the VEB Kabelwerk Oberspree in BERLIN-Oberschoeneweide, Wilhelminenhof Strasse 74-76. An R & D section for precision mechanics and optics is located in BERLIN-Adlershof, and an assembly plant for particularly sensitive precision instruments is located in BERLIN-Koepenick. Since 1957, the construction of a new building complex for the "Institut fuer Geraetebau" has been projected; however, it was not possible thus far to commence with the actual construction. A site for the new building complex was selected at the Hakenberg in the vicinity of the RR station, BERLIN-Gruenau. It is expected that construction will commence in 1958.

Scientific director of the "Institut fuer Geraetebau" since 1956, is Dr. JAHNKE a physicist, who used to be employed with "Osram", and was in the USSR for many years. He is assisted by BEETZ, (fnu), a graduate engineer, who is the second director, and comes from the Technical College in DRESDEN. Chief of the construction section is an engineer, PIETSCH, (fnu). Since the R&D laboratories represent the most important part of the Institute, a brief description of a number of laboratories with which source is familiar, is given in the following paragraphs:

a. Laboratory for Nuclear Physics

Chief of the laboratory is KLEIMON, (fnu), a graduate physicist, who has on his staff one scientist, four engineers, three laboratory assistants, and one mechanic. The laboratory is presently engaged in the development and construction of dosimeters(X-ray dosimeter and pocket dosimeter), Geiger-Mueller tubes of various types, and "Probenwechsler" for the automatic changing of test samples subjected to radiation by isotopes. These items were on display at the LEIPZIG Spring Fair 1958. Still in the phase of development in May 58 was a "Kernresonanz Magnetometer" (nucleus resonance magnetometer) for nucleus measurements; however, source has no details.

b. Laboratory for Electronics

Chief of the laboratory is Dr HESSE, with a staff of approximately eight engineers. The task of the laboratory is to supply all high-frequency requirements of the Institute, for instance, the development and construction of circuits for Geiger-Mueller counters and the "Kernresonanz Magnetometer".

c. Laboratory for Magnetics

Chief of the laboratory is SUESS, Ing, with a staff of seven engineers. This laboratory is engaged in the development of magnetic amplifiers, magnetic

voltage stabilizers, and other similar items for the Institute.

d. Laboratory for Optics

Chief of the laboratory is Ing. BECKER, a former ZEISS employee, with five assistants. This laboratory is engaged in the development of optical items for the Institute.

e. Laboratory for Precision Measurements

Chief of the laboratory is Dr. von KAHLER, with five assistants. The laboratory is presently engaged in the development and construction of a "Spann-band" galvanometer, and other precision instruments for electric measurements.

f. Laboratory for Magnetic Material

Chiefk of the laboratory is KOHUT, an engineer, with one female assistant. This laboratory is engaged in the development of special materials with magnetic properties for the construction of measuring instruments.

g. Laboratory for Geophysics 50X1-HUM

This laboratory was established on 1 Jun 57, by Dr. GELBKE, who was chief of the laboratory until 1 Aug 57

Since Nov 57, Dr. SONNTAG has been chief of the laboratory for geophysics. One engineer and one mechanic are employed in the laboratory.

This laboratory is engaged in the development and construction of geophysical measuring instruments for meteorological and hydrological purposes. Development and construction work in this field was previously done by the meteorological observatory in GREIFSWALD. This observatory was closed on 31 Mar 57, and work in the development phase was taken over by the newly established laboratory for geophysics in BERLIN. The building of the former GREIFSWALD observatory is presently being used as a laboratory for gaseous discharge physics by the German Academy of Sciences in BERLIN. 50X1-HUM

Recent developments in the laboratory for geophysics were as follows:

(1) Bordwetterhuette, a meteorological station for the remote control measurement and registration of meteorological data, particularly suitable for utilization aboard ships in order to determine representative values. For this purpose, the measuring elements of the apparatus are attached to the upper bean of the main mast of a ship. Successful experiments were conducted with the station installed on board the fishing vessel, "Robert Koch", in 1957/58, cruising in the Barents-See. With the aid of this station, it is possible to determine values of air temperatures by means of athermistors; humidity, by means of a strand of 2 x 18 hairs moving a potentiometer (hairs used are first roll-pressed according to the Frankenberger process to enlarge their surfaces); wind direction by means of a wind vane combined with a synchro; wind velocity by means of a "Schalenkreuz"

rotating a generator; and water temperature bymeans of thermistors. In a ship's cabin, the other parts of the meteorological station are installed. As measuring method for the determination of the aforecited values, a Wheatstone bridge is used. The required measuring accuracy of 0.1° Centigrade is accomplished by overlapping graduation of the total temperature range. For the indication of the wind components, the second synchro for the wind direction, and a specially calibrated voltmeter for the wind velocity are contained in a separate metal box. The element for the determination of the sea water temperature is installed in the pipe line feeding the coolant (sea water) to the ship's engine. The current required for the measurements is supplied by the ship's batteries. Various improvements of the meteorological station are planned for the future. Research is being conducted particularly in the field of humidity measurements where improvement in the accuracy of the measuring methods employing strands of hair is needed to overcome hysteresis. For this purpose, the infra-red interference method, as developed in the USA, has been experimented with, however, on the basis of a 50-cm-measuring range only, in contrast to the longer range applied in the USA. The VEB Carl Zeiss in JENA will produce the necessary metal interference filters. An improvement in wind measurements is contemplated by the elimination of all movable parts in the respective apparatus. Preliminary experiments have been conducted in this direction at the Greifswald Observatory by the utilization of a heated thermistor bridge. Further plans in the development of the meteorological station provide for the registration of all values with a compensating recording device on paper tape.

(2) Grundwasserlot

The "Grundwasserlot" (ground water plummet) is used for the determination of the ground water level and the temperature of the water column. It consists of two component parts: a measuring bridge and a plummet-like part attached to a two-core copper cable which is lowered to the ground water through pipes at the site of observation. The plummet-like part contains a pair of thermistors for temperature measurements, and a float which activates a mercury switch when coming into contact with the surface of the ground water. The measuring bridge works on the Wheatstone resistance method, and is in perfect balance, until contact of the float with the ground water surface is accomplished, at which time it will indicate the level of the ground water by being off balance, and through measurement of the length of cable unrolled. The mercury wswitch likewise brings the pair of thermistors into the bridge circuit for the temperature measurements. By further lowering of the plummet-like part into the ground water, it is possible to measure the temperature range in the existing water column. A flashlight battery of 2-4 volts supplies current.

(3) Hydrological Universal Measuring Device called "Seehund"

The "Hydrologische Universal Messgeraet Seehund" consists of three component parts: a submergeable device, a cable drum bearing a 200-m, special 24-strand copper cable with a steel core, and a measuring apparatus for the observation on board the ship. By means of the submergeable device, it is possible to determine values of: water temperature with the aid of a pair of thermistors; salt content with the aid of alternating current at a frequency of 500 cycles, by measuring sea water conductance; velocity of flow with the aid of an OTT screw-propeller with 16 blades, made by VEB Regler-und Geraetewerke in TELTOW (useable for a minimum velocity of 2 cm per second); direction of flow with the aid of a compass bussole and a potentiometer; intensity of radiation permeability (cosmic rays) with the aid of six photo-elements, of which five are provided with special glass filters; intensity of extinction in a measured length of one meter with the aid of a 24 volt-60 watt projection lamp, the intensity being indicated by a photo element. The frequency range of the light is subdivided into ten sections by the use of special filters.

Storage batteries of 24 volts provide the necessary current supply. The measuring apparatus permits the simultaneous measuring of salt content and temperature; and radiation and reflection. The direction and velocity of flow can be measured continuously. An independent measuring of the extinction is likewise possible in a continuous manner. The voltage supplied to the projection lamp is stabilized by a "Heissleiterbruecke" (hot conductor bridge in the form of two miniature incandescent lamps) at a value not to vary more than one millivolt. The measurement of the salt content takes place by the comparison method using KOPENHAGEN seawater as norm (Kopenhagener Normalwasser) in a thermostat.

The afore-described devices were displayed at the pavilion of the German Academy of Sciences, BERLIN, during the LEIPZIG Spring Fair 1958. However, no brochures nor any other publications are available on these devices to this date. The prototypes then on display did not include any of the improvements mentioned above.

(4) Tauwaage

The Tauwaage (dew scale) provides for the observation of dewfall within a given period and the quantitative measurement of such fall. A so-called biscuit porcelain plate (a non=glaze ceramic plate) is used as dew collector. The change in weight due to the fall of dew is compensated for by a special electronic circuit moving a weight. Since the "Tauwaage" indicates and registers values by remote control, particular interest in this device has been displayed by specialists in an effort to utilize the device in studying flashovers and/or surface leakage in high-tension lines as a result of dew collecting on the insulators. The "Tauwaage" is a regular production item of the VEB Junkalor in DESSAU, and will be on display at the LEIPZIG Fall Fair in 1958 or at the Spring Fair in 1959.

(5) Viscosimeter

The viscosimeter is still in the planning stage and will be fully developed by the end of 1958. It is a device for the determination of the viscosity and temperature of plastics. The damping effect whihh a plastic mass has on a tongue-like element vibrating at a frequency fof 100 cycles in such mass, is the measure of the viscosity of the plastic.f During the manufacturing processes of plastics it is necessary to observe and control continuously the viscosity and temperature of the plastic mass, for which reason the tongue-like element simultaneously measures the temperature by means of a thermo-element or a miniature thermistor. A particular advantage of the viscosimeter is its small size (similar to a fountain pen), which permits dipping the device into the actual processing vessel, and thus eliminates repeated removal of samples from the mass.

(6) Calorimeter

Plans exist for the development of a new type of calorimeter with a measuring range from minus 70° to plus 70° centigrade; however, no details are available.

(7) Stummer Beobachter (Silent Observer)

Upon the initiative of the Meteorological Service in POTSDAM, a "Silent Observer" was to be developed in 1958. "Silent Observers" are to be

constructed in the form of small meteorological stations built into buoys at sea together with a transmitter for the automatic registration and remote communication of seawater and air temperatures, humidity, wind direction and velocity, swell of the sea, and conditions of visibility at sea.

2. Technical Data, Design Drawings, and Circuit Diagrams Available

Attached as Inclosure 1 are photostats of designs, and/or circuit diagrams pertaining to the Bordwetterhuette (meteorological station); Grundwasserlot, (ground water plummet); Seehund, (Hydrological Universal Measuring Device); Tauwaage (dew scale); Horizontaler Wasserschoepfer zur Enthahme von Wasserproben aus langsam stroemenden Gewaessern (horizontal water-drawing device for drawing samples from slow currents); Kippwasserschoepfer zur wirbelfreien Entnahme von Salz- und Suesswasserproben (tilting device for drawing samples from salt (sea) and fresh water in a non-turbulent manner); Bruecke zur Messung der Feuchte auf kapazit vem EWefe (bridge for the measurement of humidity by a capacitive method; Elektronisches Steuergeraet zum Pyrgeometer (electronic control device for the pyrgeometer); Schaltbild (und Photographien) zum Windmessverfahren mit Thermistoren (circuit diagram (and photos) pertaining to the wind-measuring method by means of thermistors); and Schulungsmaterial zur Ausbildung von Wetterdienst-Technikern an Observatorien (training material for material for meteorological technicians at observatories). 50X1-HUM

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