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ACTIVITIES OF THE SCIENTIFIC AND TECHNICAL SOCIETY OF THE SHIPBUILDING INDUSTRY

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Ninth Scientific and Technical Conference on Structural Mechanics, Dedicated to the Memory of Corresponding Member of the Academy of Sciences USSR - Professor P. F. Papkovich.

[Following is the translation of an unsigned article entitled "Devyataya Nauchno-Tekhnicheskaya Konferentsiya Po Stroitel'noy Mekhanike, Posvyashchennaya Pamyati Chlena-Korrespondenta AN SSSR Professora P. F.Papkovicha" (English version above), in Sudostroyeniye (Shipbuilding), Vol 8, 1960, page 74.]

In Leningrad, on 5-6 May, 1960 was held the regular annual scientific and technical conference on structural mechanics, organised by the structural mechanics and hull construction section of the Central Administration of the NTO (Nauchno-tekhnicheskoye obshchestvo - Scientific-Technical Society) of the shipbuilding industry.

First prize was awarded to a series of articles by Candidate of Technical Sciences V. S. Chuvikovskiy on the subject "The Concurrent Vibration of the Hull and Plates of Ship".

Second prize was won by Candidate of Technical Sciences V. S. Kalinin for a number of published works on the problem of non-linear curve vibrations of homogeneous prism-shaped rods.

Third prize went to Engineer Ye. A. Pavlinova and Candidate of Technical Sciences M. V. Filippec for their work entitled "Research on the Durability and Stability of Goffered Bulkheads in Ships".

After announcing the results of the contest for the Prof P. F. Papkovich Prize for 1959, the Conference turned to the presentation of individual reports.

In the report of Candidate of Technical Sciences V. S. Kalinin "Non-Linear Curve Vibrations of Uniform Prism-Shaped Rods" were presented the fundamentals of the theory of constrained non-linear curve vibrations of homogeneous prism-shaped rods arbitrarily affixed to supports. The closed form of the line of elasticity was sought by means of the solution of the corresponding equation (and was not chosen, in the usual way, to fit one or the other suitable function of the axial coordinate of the beam). This permitted the determining of the tensile state by a single method under rather generalized conditions, and affording a concomitant increase in exactitude, which was greater than that of a solution for a form selected in advance. In addition, this work established the dependence of the form on the frequency of the disturbing force and the range of vibration, of which, taking into account the non-linearity factor, there may be several.

The method worked out by the author is suitable for the solution ofproblems both in marine engineering and in allied fields (e.g., for investigating the flutter of a two-dimensional foil, with a flow of gas over one side).

The report of Candidate of Technical Sciences V. S. Chuvikovskiy, "Quasi-Static Calculation of Several Linear and Non-Linear Mechanical Systems Under the Action of Arbitrary Dynamic Loads," offered a means of dynamic calculation in the analysis of complex systems (chain, rod systems, etc.), based on a preliminary determination of the so-called quasi-static flexibility coefficients of their elements, the delineation of the static indeterminacy of the system by known quasi-static flexibility coefficients, and on the consequent conjoining of the elements under consideration, for various time increments. The advantage of this method lies in the convenience in programming the computations on an electric computer, and also in the fact that the utilization of the usual method of principal coordinates for calculation of complex linear systems on the action of arbitrary dynamic loads is very difficult, and is sometimes unfeasible in practice because of the sharp decline in the accuracy of approximation as the complexity of the system increases. Even greater difficulties arise in the calculation of non-linear systems.

The report presented an illustration of the use of the suggested method for calculating dynamic sag and the dynamic stability of unflitched beams, frames and several other types of hull structures.

The report examined a certain modification of the suggested method which would allow the calculation of the vibration of chain systems, and also of rods and rod structures with arbitrary non-linear strengths and non-linear hardness of their elements.

The report of Candidate Technical Sciences M. F. Filippeo "Research on Durability and Stability of Goffered Bulkheads in Ships" set forth the results of several new investigations into the durability and stability of goffered bulkheads with warped and undulate goffers as regards transverse loads and loads lying in the same plane as the bulkheads and oriented in various ways relative to the direction of the goffers (general curve of the vessel, docking, launching, etc.).

The extensive theoretical investigations of these problems were tested by experiment.

The report of Candidate of Technical Sciences V. A. Postnov, "Vibration of Bottom Overlaps as an Orthotropic Plate," investigated the question of the curving and vibration of bottom overlaps regarded as an orthotropic plate with regard to the influence of displacement. The author obtained two congruent differential equations of equilibrium, the joint solution of which permits the determination of the curving and displacement form of the vibrations of the overlap under investigation. These equations are a generalization of the existing theory of the curving of bottom overlaps as an orthotropic plate.

In the author's opinion, the equations may be recommended for practical calculations of the vibrations of bottom vessel overlaps. The results achieved in this work also permit a more accurate definition of the size of the adjoining strips which form a part of beam cross-sections in calculating the vibration of the bottom overlaps as a system of intersecting beams.

The report of eng. Ya. S. Sidorin "Deformations and Reduction Coeffcients of Plates Upon Stability Losses Resulting from Displacement" contained the results of theoretical and experimental investigations into the deformations of plates which had been freely

supported and rigidly affixed to the support contour, and which lost their stability as a result of displacement. The report evaluates the carrying capacity of these plates by introducing into the durability calculations of a certain reduction coefficient, and also the influence of the method used in fastening the plate selvage (its tendency of its elements not to drift together, and its rectilinearity) on the dependence between sag and the increase in the corresponding Euler stresses by the tangent stresses. The problem is being solved by the direct integration of the Karman system of differential equations by means of the Bubnov-Galerkin method of numerical approximation.

The report also set forth the results of experimental investigations on isolated plates, as well as plates comprising the overlap system, after they had lost stability as a result of displacement; this work was done on an extremely powerful MUG-500 experimental machine. The results achieved may be useful in solving various problems connected with the work of the high beam walls, durability evaluation of sheets used in transverse bulkheads and frame paneling in the area of maximum transverse stress.

The report of Docent L. V. Dikovich entitled "A Method of Calculating the Position of a Vessel in a Floating Dock", the hull and dock were considered as two elastic beams with variable moments of inertia, united in a one-piece elastic base of variable rigidity. To solve the problem the beams were divided lengthwise into a finite number of sections of equal length. The load, the moments of inertia and the coefficient of rigidity of the elastic base were taken as constants within the limits of each section. With this prerequisite the problem is reduced to the integration of a system of equations with the constant coefficients, and a method of obtaining a solution with any degree of accuracy desired is thus achieved.

The report of Engineer L. I. Slepyan "Transverse Vibrations of Rods Under the Impact of Shock Loads" examines several problems in the deformation of elastic prism-shaped rods subjected to the action of suddenly applied transverse or longitudinal forces. The author found parameters characterizing the deformation wavefronts and showed that all ruptures may be described by a net displacement equation.

The net displacement solutions, obtained in closed form were utilized for improving the convergence of the series which constitute the solution of the problem.

It is recommended that the exansion interval in the summation of the series over small time increments be considered as a function of time, thus preventing any deterioration in convergence.

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