speed than reciprocating engines, the necessity of seeing that the propellers were suitable not only as regards form, but also as regards their being in proper mechanical balance, has received considerably more attention. Experiments have been carried out in two destroyers and a Town class cruiser built at the Commonwealth Naval Dockyard at Sydney. The paper describes experiments made by rotating the propeller at speed on spring bearings, noting the vibration and removing material from certain parts of the blade and even the boss. From subsequent observations on the ships it was apparent that there was a decided improvement. The problem to be solved is by no means easy, since removal of material from the blades of a propeller has the effect of altering the pitch, and naval architects, as a rule, have very stringent specifications regarding the exactitude of the pitch of a propeller.

Sir George Greenhill contributed a paper on the theory of wave-motion on water. In this paper the author discusses mathematically the trochoidal wave as treated by Rankine. Mr. John H. Macalpine gave particulars of marine applications of reduction gears of the floating-frame type. The success of this type of gear appears to be very marked. The first floating-frame gear was installed at Granite City, Illinois, in 1911; when examined on April 30, 1916, the scraper marks were still visible on the gear teeth. Originally these marks were of imperceptible depth.

Messrs. P. A. Hillhouse and W. H. Riddlesworth presented a paper on launching. This paper contains an account of some interesting experiments made at the Fairfield Shipbuilding Yard. A model of the ship was constructed and arranged in all respects to be a reduced copy. Model ways were constructed and a tank arranged with water at proper tide level. By these means valuable information was obtained regarding the motion of the ship during launching. The authors make an interesting suggestion whereby an accurate record of the complete motion of the actual vessel from start to finish might be obtained by means of the kinematograph. Two machines would be required, one placed near the stern of the vessel when on the slip, and the other somewhat less than the length of the vessel further aft. Both would stand at a convenient distance away from the vessel's side, and would have their axes at right angles to the middle line of the berth. In the field of view of each, two uprights would be placed as near to the vessel's side as possible, and on each upright a vertical scale of feet would be clearly marked in black and white. On the ship's side would be painted a continuous longitudinal white line crossed by short vertical lines numbered in succession from either end. As the vessel moved the cameras would record continuously the movements of the white line in relation to the ship and to the water level and ground ways, and the whole motion could be reconstructed. If, in addition, there could be placed in front of each camera a large clock-face with seconds pointer, the two sets of photographs could be correlated and a record of velocities obtained.

BRITISH FILTER-PAPERS.

AS is well known to laboratory workers, in pre-war days the better kinds of filter-paper used in chemical operations were not produced in this country. They were imported chiefly from Germany and Sweden. In particular, the so-called "ashless" filters, from which most of the mineral matters have been extracted by treatment with hydrochloric and hydrofluoric acids, had made the name of one German firm familiar in probably every chemical laboratory of importance throughout the kingdom. The outbreak of war, however, stopped the supply of German filters, and British paper-makers turned their attention to meeting the demand.

The qualities required in filter-paper depend upon the purpose to which it is to be applied. Thus for certain technical operations, such as the filtration of oils and fruit juices, a soft paper of open texture is desirable. Further, as such paper is often used for filtration under pressure, a high degree of elasticity is required in it to prevent fracture. In analytical work, on the other hand, whilst a paper with open texture which filters rapidly is preferable for flocculent precipitates like ferric hydroxide, a close-texture paper is required for the retention of fine precipitates such as barium sulphate. Moreover, the proportion of mineral matter is important. Compounds of calcium and iron, frequently with a little copper, and sometimes silica and alumina, are the chief mineral impurities found in filter-paper; and for accurate quantitative work the amount of these should be small. Indeed, it should preferably be so small as to be negligible except where a high degree of exactitude is required. In any case, it should be definitely known, and ought always to be stated on the packets of filters by the makers.

The ability to retain fine precipitates, a minimum proportion of ash, and reasonable rapidity of filtration are thus the chief desiderata in the best filters for chemical laboratory purposes. The last alone is sufficient in many technical operations. Discussing this question in the *Analyst* some months ago, Messrs. Bevan and Bacon indicated that for paper required to filter with moderate rapidity the ratio of the volume of the paper to that of its constituent fibres should be about 3·5 to 1. It does, in fact, as a rule vary between the limits 3 and 4·5 to 1. "Pinholes" are sometimes found in paper having this ratio or "bulk" (as the technical term goes); they are attributable to faults in the milling.

Some time ago specimens of the filter-papers now produced in this country were supplied to us by three manufacturing firms, namely, Messrs. W. and R. Balston, Ltd., Maidstone; Messrs. J. Barcham Green and Son, Maidstone; and Messrs. Evans, Adlard and Co., Ltd., Winchcombe. Judging by the reports furnished with certain of the papers, supplemented by tests applied in actual working practice, a number of the samples compare quite well with the foreign filters which they have replaced. It is evident that a serious endeavour is being made to produce filters which will compare favourably in quality with even the best of those hitherto imported, and the efforts appear to have met already with a considerable measure of success. Naturally, it will take time and careful study completely to outvie the foreign articles, which are the result of long specialisation. Uniformity of product is an important point to aim at, so that the user may know that he can rely upon the constancy of the quality. There is no obvious reason why British paper-makers should not, with proper technical advice, compete successfully with foreign manufacturers in this branch of industry, and, in fact, there is good reason to believe that they will do so. In this matter, as in so many others, we ought not to have to revert to the *status quo ante bellum*.

COMPULSORY CONTINUATION CLASSES.

THE final report of the Departmental Committee on Juvenile Education in Relation to Employment after the War has just been issued (Cd. 8512, price 6*d*. net).

The terms of reference of the committee were: To consider what steps should be taken to make