Hydraulic Couplings and Torque Converters

IT is indicative of the interest being taken by engineers in the comparatively recent hydraulic method of transmitting torque and to the importance attached to its development that three papers on this subject were read during April and May before the Institution of Mechanical Engineers. Its application, as the fluid flywheel, to automobile drives has attracted to it the attention of a much wider public than the engineering profession.

Some misconception is prevalent regarding this method of transmission. While it is rightly understood that power is transmitted from one disc—the 'driver' or 'impeller'—to another quite unconnected disc—the 'runner'—by the action of the oil which is kept in circulation, it is assumed by many that the oil is enabled to do this by acquiring some quality of lateral resistance due to an extraordinary degree either of shear resistance or of viscosity imparted to it by the circulatory velocity. In fact, however, the explanation is much simpler. The 'impeller' disc acts on the oil as a centrifugal pump imparting kinetic energy to it, and discharges it into the 'runner' disc, which operates as a turbine and receives energy from the liquid. Its discharge goes back to the impeller for the next cycle of energy transfer.

In his paper "Recent Developments in Hydraulic Couplings" (*Proc. Inst. Mech. Eng.*, April 26) Mr. Harold Sinclair explains the fundamental differences between the two systems of hydraulic transmission—the displacement or hydro-static system and the turbo or hydro-kinetic system, to which latter these couplings and converters belong—and the main advantages of the turbo system. Following a brief historical survey from the pre-War speed transformers originated by Dr. Föttinger for marine turbine propulsion, he outlines the elements of the theory on which this type is based. Proceeding mainly in a descriptive and explanatory vein, the author devotes the bulk of his paper to the development of the Vulcan-Sinclair Coupling. This is a modific tion of the Vulcan marine type to meet the conditions of industrial and automotive service, and particulars are given of its application in three distinct forms: (1) the scoop type for constant speed motors driving variable speed machines, (2) the traction type, including the fluid flywheel, for variable speed engines and motors, and (3) the ring valve traction type for both constant and variable speed engines.

In "Voith Turbo Transmissions" (*Proc. Inst. Mech. Eng.*, May 3) Dr.-Ing. Wilhelm Hahn discusses the application of torque converters and hydraulic couplings. The former, having in addition to the two discs—the 'impeller' and the 'runner'—a stationary guide ring, is enabled to step up the value of the torque and so is capable of overcoming a high starting resistance. After examining theoretically the relationship between power, torque and speed in a torque converter and considering the conditions for maximum efficiency, he suggests that, to attain as nearly as possible to the ideal torque curve, the torque converter be used for starting up and that, at the appropriate moment, a change-over be effected to the direct drive of a hydraulic coupling.

The necessity for this change-over and the duplication it involves arises from the practical difficulty of fitting the converter with variable blades on the stationary ring so that it is adaptable to all conditions. In "Progress in Design and Application of the Lysholm-Smith Torque Converter" (*Proc. Inst. Mech. Eng.*, May 3), Messrs. Haworth and Lysholm discuss the theory of blade friction and the results of experiments. The main points to be provided for in design are set forth and the results of experiments showing the effects of various blade angles and wheel diameters are given, together with the results of several applications, including a 1,000 h.p. variable blade converter.

Taken together, the three papers give a very good picture of the present position in this practically new method of fluid transmission.

The National Museum of Natural History, Paris

THE National Museum of Natural History, Paris, which was founded by Guy de la Brosse in May 1635 on the site of the Jardin des Plantes—"Le Jardin du Roy"—by an edict of Louis XIII, celebrated its tercentenary in Paris during the last week of June. The celebrations commenced on June 21 with a reception of the delegates by the director and the professors of the Museum, but the most impressive part of the various ceremonies was the *séance solennelle*, which was held in a special marquee erected in the Jardin des Plantes on the afternoon of June 25. This ceremony was attended by about 570 French and foreign delegates, representing 35 academies, 71 universities, 117 scientific institutions and 110 scientific societies, and was honoured by the presence of M. Albert Lebrun, the President of the Republic. The Minister of Education, M. Mario Roustan, presided, and the delegates presented their addresses at the commencement of the *séance*.

Speeches were made by M. Paul Lemoine, director of the Muséum National d'Histoire Naturelle; by the Governor-General, M. Olivier (president of the Society of Friends of the Museum); by M. Alfred Lacroix (member of the Institute and professor at the Natural History Museum), speaking in the name of the Academies; by M. M. Caullery (member of the Institute and professor at the Sorbonne), in the name of the French delegates; and by Sir Arthur Hill (director of the Royal Botanic Gardens, Kew),

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in the name of the foreign delegates. The proceedings concluded with a speech by M. Mario Roustan, the Minister of Education.

Sir Arthur Hill, after referring to some of the distinguished botanists who had made the name of the Museum famous throughout the world, concluded a noteworthy speech, which brought the whole company to their feet, with the following words:

"Tous ceux-ci—et beaucoup d'autres—ont fait rayonner leur lumière sur le monde entier, au travers de ce Temple Renommé, le Musée National d'Histoire Naturelle.

"M. le Président, permettez à un botaniste de vous rappeler la fameuse parole de votre grand philosophe Pascal: L'homme fut perdu et trouvé dans un Jardin. Dans le premier jardin, le Jardin d'Eden, l'homme ouvrit la porte de la Science en mangeant le fruit de l'arbre de la connaissance du Bien et du Mal. Pouvons nous exprimer l'espoir que, non-seulement en France, mais au travers du monde entier, malgré les temps si troublés que nous traversons, unis dans un même idéal de tolérance et d'harmonie, les chercheurs de la Vérité verront leurs efforts récompensés par la découverte de cet autre arbre—'L'Arbre de Vie', dont les feuilles nous assureront la Paix eternelle, parmi les Nations?

"M. le Président, je prie mes collègues Délégués de se joindre à moi, et, debouts, de rendre hommage à la mémoire de ceux qui ont fait le nom de ce Musée si grand, et d'offrir avec moi nos meilleurs vœux pour la continuité de la prosperité et la gloire du Musée National d'Histoire Naturelle."

In the evening there was an official banquet attended by some seven hundred guests, and the Earl of Crawford spoke on behalf of the British delegates.

Another event of the week was the opening of the Grande Galerie de Botanique du Jardin des Plantes, the erection of which was assisted by a grant from the Rockefeller Foundation. This magnificent new building consists chiefly of the herbarium, which is one of the largest in the world. The building is fire-proof and the herbarium cabinets are constructed of metal. There is very limited table space, and most of the research work is carried out in the adjoining private rooms and laboratories, several of which have been set aside for the use of visitors. There is, moreover, particularly good accommodation for workers on the lower cryptogams, some seven rooms being set aside for algology, and an equal or larger number for mycology. Including more or less loosely attached workers, there is a large staff, but the new herbarium laboratories are also used by university students in connexion with research for degree theses.

Visits were paid to the Château of Chantilly and various museums, as well as to the zoological parks at Clères and Vincennes and the experimental grounds and laboratories of M. Vilmorin. The celebrations in Paris were very pleasantly brought to a close by a garden party at the Élysée, when the President of the Republic and Mme. Lebrun received the delegates.

At the end of the festivities an excursion was made to Mont Saint-Michel, Saint-Malo and Dinard, and at Dinard the new museum and aquarium, recently completed, was formally opened in the presence of a large number of the delegates.

Thanks to M. Lemoine, the director of the Museum, to Dr. Jeannel, who was acting as secretary, and his assistants, the arrangements for the celebrations were admirably carried out.

A very interesting exhibition of portraits of all the distinguished botanists, zoologists and others connected with the Museum, together with a fine collection of old prints and pictures and many other objects connected with the history of the Museum, had been arranged in the Exhibition Hall of the recently completed herbarium and botanical laboratories referred to above.

Academies, universities and scientific institutions from all over the world sent delegates to the celebrations. The following institutions, among others, of Great Britain, were represented: Royal Society (Earl of Crawford and Balcarres and Dr. C. Tate Regan); British Museum, Natural History (Earl of Crawford and Balcarres, Dr. C. Tate Regan and Mr. J. Ramsbottom); Royal Botanic Gardens, Kew (Sir Arthur Hill and Mr. A. D. Cotton); British Association (Mr. J. Ramsbottom); and the Linnean Society of London (Mr. J. Ramsbottom and Prof. G. D. Hale Carpenter).

Biological Distribution of Molybdenum

PROF. H. TER MEULEN, of Delft, continues his studies on the distribution of molybdenum in the organic world, with the help of Miss H. J. Ravenswaay (*K. Akad. Wet. Amsterdam, Proc.*, **38**, i; 1935; see also NATURE, **130**, 966; 1932). Finding in various samples of Dutch East Indian tobacco no less than 0·5–0·7 mgm. of molybdenum per kgm., he went on to determine the molybdenum content of the soil in a number of tobacco plantations. In some the amount was small, 0·01–0·07 mgm. per kgm.; in others it was ten times as much, 0·12–0·3 mgm.; and the latter were always the best plantations, growing the best tobacco.

Next, Prof. Ter Meulen extended some former studies of the seasonal variation of molybdenum in leaves; he finds in about a dozen different trees that the amount per kilogram, or per 1,000 leaves, either remains constant or sometimes increases considerably, from the young leaves of spring until the autumn leaves are about to fall. In other words, the molybdenum does not migrate from the old leaves to the other tissues of the plants, but merely returns with the fallen leaves to the soil. The horse-chestnut is an exception; here the amount of molybdenum in the leaves decreases in September and still more in October. But the horse-chestnuts themselves contain this element in considerable amount, and have, in all probability, withdrawn it from the leaves.

A third interesting point is a comparison of the molybdenum content in the brown and green varieties of *Prunus*, hazel and beech. Leaves were plucked on the same day, and the molybdenum estimated in mgm. per kgm. of moisture-free material. The curious and striking result was that in all three species the brown-leaved varieties were found to contain about twice as much molybdenum in their foliage as the green ones.

Still more recently, Prof. Ter Meulen has studied the molybdenum content of human teeth, sound and carious, and finds the sound teeth to be very much richer in molybdenum than the unsound. In all these cases it seems natural to suppose that the molybdenum is playing its part as a catalyst, and as such it would seem to be of widespread use and importance.

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