WR^2—AN EXPLANATION

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QUITE a few instances there have been in which the writer has noticed that many engineers are hazy in their conceptions of WR^2, and what it means in terms of energy absorbed or given out by virtue of a speed change. It is a true measure of the tendency of a mass to continue rotation when forces are applied to stop it, or the tendency to resist rotation when forces are applied to set it in motion. In common language, we call it inertia.

Technically defined, it is the summation of the individual weights multiplied by the square of their radius from the centre of rotation. In connection with generators and flywheels, we usually speak of so many pounds weight at one foot radius, the unit being especially convenient because its square is still one, and the weight at any other radius varying inversely as the square of the radius.

As the question is usually stated, we want to know how many footpounds of energy is given out when the rotating body is retarded from N r.p.m. to N_1 r.p.m. To make this clear, we will go back to the well-known formula for kinetic energy:—

$$\text{Kinetic Energy} = \text{Mass}/2 \times \text{Velocity}^2 \quad \ldots\ldots\ldots (1)$$

Now mass is simply the weight of the body divided by 32.2, the acceleration due to gravity. The velocity of a point rotating at a radius R in feet per second is

$$v = 2\ RN/60$$

where N is the r.p.m. For those who prefer to use angular measure, we have

$$v = wR$$

w being the angular velocity in radians per second.

Inserting the above equivalents in (1), we now have

$$K.E. = W\ (2\pi\ RN)^2/2g60^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

It will be seen at once from (2) that if we reduce all the weights of the rotating mass to 1 ft. radius, we can substitute WR^2 for WR, because one raised to any power whatsoever is still one. We can now express (2) in terms of WR^2. We have

$$K.E. = WR^2\ (2\pi\ N)^2/2g60^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Reducing (3) to its lowest terms, we have

$K.E. = 0.00017\ WR^2N^2$ as the total available energy in foot-pounds, whether used up in one second or in many hours.

When designing brakes we require to know the energy required in the form of friction to stop the rotating body and which is given by (3).

For computations involving flywheel effect, we want the energy given out or absorbed between certain speeds in r.p.m. from N to N_1 r.p.m. This is

$$K.E. = 0.00017\ WR^2\ (N-N_1)^2$$

and which varies inversely as the time element.

In the design of flywheels it is usual to put about 90 per cent. of the required WR^2 in the rim, and if the arms and hub are well designed there will be about 10 or 12 per cent. of the WR^2 in them. This, of course, would not strictly apply in the case of very light flywheels, as the arms and hub in such a case would form a much larger percentage of the total weight.

FILTRATION PLANT FOR PETERBOROUGH

LAST Friday evening the city council at Peterborough authorized the Utilities Commission to purchase property on which to build a water filtration plant. The property purchased is near the waterworks station and was acquired for only $7,000. It was stated by a number of the aldermen that the water supply, though treated with chlorine at present, is not of the standard desired, and they realize that the installation of a filtration plant will be imperative within the next few years at least and probably sooner.

IMPERIAL OIL'S GIFT TO SARNIA

HON. W. J. HANNA, president of the Imperial Oil, Ltd., on behalf of that company, has presented an asphaltic pavement to the city of Sarnia, Ont., where one of the company's main refineries is located. The pavement extends along Milton St. to Green St. and to the G.T.R. depot, and was laid by the Warren Bituminous Paving Co. at a cost of over $60,000.

At the presentation ceremony the mayor paid a tribute to the Imperial Oil Company, stating that during the whole twenty-one years in which that establishment has "carried on" industrially at Sarnia, there has never been any friction whatever between the city of Sarnia and the company. They had pulled together for one common good. One was ever at the other's assistance. He characterized the presentation of the pavement as one of the best gifts that any municipality could receive in the age of greater progress along good roads lines. It was an example set.

Mr. Hanna replied in a fitting manner for the donors. He told the story of the origin of the idea of the presentation to the city. He was in the south when the suggestion first came under his notice by wire. He realized Sarnia's supreme need, as is the supreme need of every other city and municipality, to be good roads, and he readily endorsed the idea.

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A Washington report states that a plan for a deep waterway from the Great Lakes to the Atlantic, by way of the St. Lawrence River, will soon receive new impetus. Senator Townsend, of Michigan, who intends to continue his advocacy of an investigation of the merits of the project, believes that the St. Lawrence can be canalized much more effectively than at present, and that the channels at the Soo should be deepened.

The Honorary Council for Scientific and Industrial Research held a conference last week with the Research Council of the Royal Canadian Institute. Addresses were delivered by Dr. McCallum, of the University of Toronto, President Murray, of the University of Saskatchewan, and President McKenzie, of Dalhousie University. It was stated that there are special opportunities for young men who are willing to undergo training in research work, as the supply of men who are trained to do this work is said to be limited in Canada.