A ROUGH-AND-READY DYNAMOMETER FOR
SMALL MOTORS.

BY JOHN HOSKIN.

[Read at the meeting of the Electrical Section, held May 5, 1891.]

I have been requested to bring to your notice this evening a friction-brake dynamometer that is by no means new, but is one that is deserving of being more widely known by electricians than appears to be the case.

Like the well-known Prony brake it acts as an absorption dynamometer; and without detracting from the acknowledged value of this instrument, especially for testing the value of large prime-movers, yet we need something more portable, more convenient to use, in the very numerous cases where it is desirable to test the efficiency of small motors.

We need a rough-and-ready instrument that is portable, inexpensive, readily used, and at the same time reliable.

This we find in a friction-brake dynamometer, one of the many modifications of those illustrated by Mr. William Worby Beaumont, in his paper on friction-brake dynamometers, read before the Institution of Civil Engineers in London, November 13, 1888, and published in 1889 in the *Proceedings* of the Institution.

Its construction requires only the use of a leather belt with a spring balance attached to one end, and a suitable weight at the other. The belt is to be thrown over the belt pulley of the motor, the spring balance is fastened to the floor base, or support of the motor to be tested, and the weighted end hangs pendant on the side of the pulley which, when in motion, will tend to lift the weight. When the motor is at rest, the strain of the weight should be read off on the spring balance. This reading we will call W . When the current is switched on and the motor runs at speed, the spring balance should again be read off, since the friction of the pulley on the belt will have a tendency to raise the weight; this reading we will call W' . The difference

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between W and W' in pounds, multiplied by the circumference of the pulley in feet (including one-half the belt thickness on each side), and this by the number of pulley revolutions per minute will give the foot-pounds of mechanical energy, which can be compared with the electrical energy required to produce it, in the usual manner.

Thus, in a few minutes with the aid of a speed counter or tachometer, a voltmeter and an ammeter, the efficiency of a motor can be determined, and its ability to do a desired amount of work ascertained at once, instead of being left to guess-work, as would often be the case if more bulky or elaborate apparatus were needed.

It should not be imagined from these remarks that this form of dynamometer is applicable to small motors only; but it is evident that for testing larger machines where many horse-power have to be measured, the apparatus needs more elaboration, especially in the use of friction blocks under the belt or pulley strap, their lubrication, and the use of a dash-pot to steady the brake when the motive-power is irregular.

But I need not enlarge on this, except to say that in these particulars, whether using steel strap, or leather belt with friction blocks, or rope friction, the same care is needed as in the Prony brake to obtain correct readings.

Before concluding, I submit to your consideration the value of the Waldron rotary pump for use as a dynamometer, although I have never heard that it has been applied to that purpose. In examining one of these engines recently for other purposes it occurred to me that it would serve as an excellent dynamometer.

This pump is operated by rotary piston blades working in a chamber, without leakage, and with but small friction, the amount of which can readily be ascertained and calculated for use as a "constant." Its capacity per revolution, and the number of revolutions being known, as also the pressure against which it works, which can be regulated by a pressure gauge, the foot-pounds of work are at once arrived at.

This method of measurement will correctly register the

work done, although the speed may be irregular; and its results can be made more accurate than that of the friction dynamometer, because not subject to the irregularities arising from differences in lubricants, temperature, etc., which makes it necessary to use adjusting screws in most forms of friction-brake dynamometers.

THE VALUE OF OIL AS AN INSULATOR FOR HIGH VOLTAGE CURRENTS.

BY DAVID BROOKS.

[Read before the Electrical Section, May 5, 1891.]

Even as late as 1884, in the electrical works, oils were placed among conductors. For instance, James T. Sprague, in the second edition of his book, places them among conductors "in the order of their specific gravity." His first patent for the use of oil as an insulator was taken out in 1878, and now the matter is receiving great attention among the electricians of Europe. In the *London Electrical Review* there is an account of tests by Siemens and Halske, of Berlin, in which they state that an ordinary Siemens electric light cable was inserted, and broke down at a pressure of some 15,000 volts, but when oil was used, it perfectly withstood the pressure as high as 20,000 volts.

Oil has been used in Switzerland with complete success, not only for insulating wires, but also for transformers.

The writer has made the following experiment to show how much better oil is than the air for insulation. A large Holtz machine that sparked 7.5 inches through the air was unable to puncture the insulation of a cable of twisted wires separated one-fourth of an inch, when immersed in oil.

The ends of the twisted wires, were spliced to rubber-covered wires, and these were attached to the poles of the Holtz machine, after glass tubes had been drawn over them. The twisted wires were then placed in a jar contain-