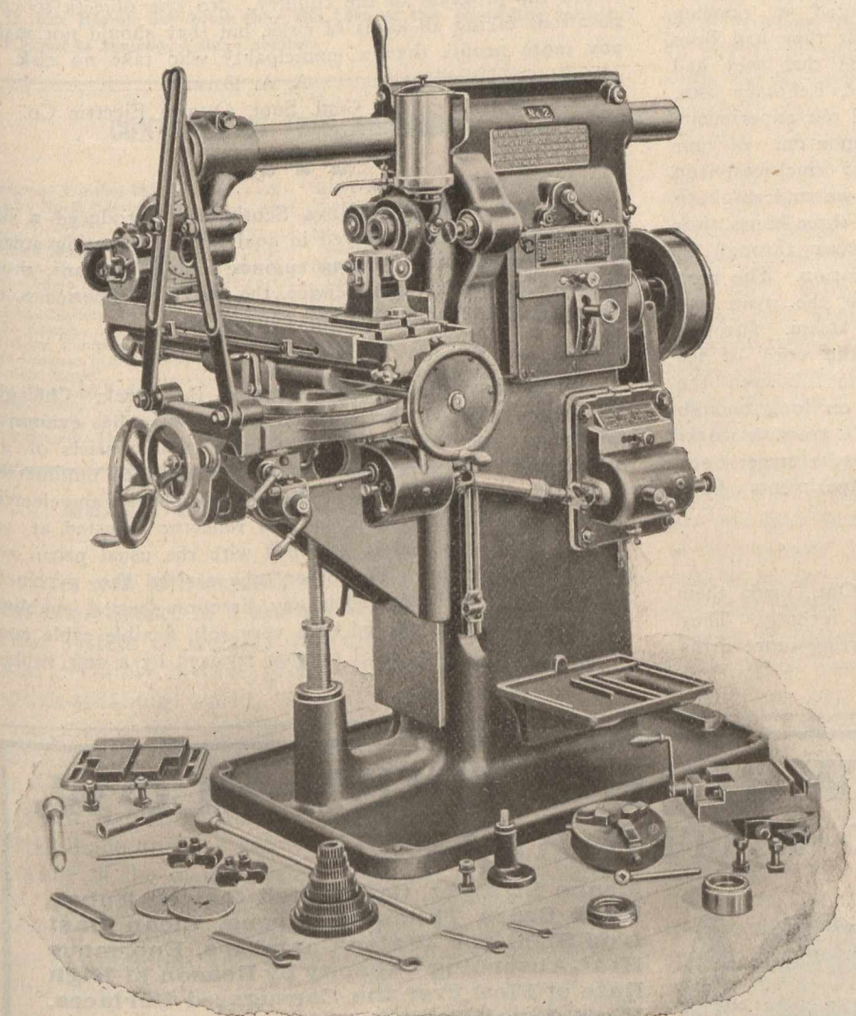
Pembroke; Messrs. Fitzgerald and Blair have been sworn in. Mr. Smith will be sworn in on the expiry of his article of apprenticeship. Preliminary examination for apprenticeship —T. G. Code, Alvinston; E. P. Bowman, West Montrose; W. Raywood Smith, London; W. H. Holland, Toronto.

MOTOR DRIVEN MILLING MACHINES.

The difficulties that have arisen in the application of the motor drive to machine tools not designed with this in view are probably familiar to our readers, who will be interested in the constant belt speed milling machine, described herewith, as being adapted to the application of this drive, and they will also be interested in the other mechanical features of this machine.

As to the motor drive, it will be readily apparent that, with a constant drive for the machine itself, the simplest constant speed type of motor of any standard make can be applied and the full efficiency be at all times available. The milling machine is one recently placed upon the market by the Brown & Sharpe Mfg. Co. It presents many features that show a radical departure from the well known milling machine construction. The difficulties inherent in the usual cone drive and a table feed dependent upon the variable spindle drive are entirely eliminated. The main drive is direct from the countershaft to the machine pulley by a belt that runs at a constant speed and provides for the use of the same size pulley on both the machine and counter-shaft, thus giving a much greater belt contact and driving lever-



age than can be obtained with the usual cone drive. All spindle speed changes are provided for in the machine, the changes being obtained by means of gearing. Spindle gearing has a ratio varying from zero to 20 to 1.

Referring to the illustration, directly to the left of the main driving pulley will be seen a plate with two adjusting levers and an index slide between them. The index slide determines the combination of gearing between the driving pulley and spindle. The lower lever carries the intermediate and engages the gears after they have been set; the upper lever gives two series of speeds, one fast and one slow, which, together with the back gears, give 16 changes of spindle speed varying from 15 to 376 revolutions per minute in either direction. The back gears are operated by a lever in the usual way; the locking pins that engage the spindle sleeve, replacing the cone head, are operated automatically by the movement of the lever controlling the back gears.

The table feeding mechanism is an important feature. The mechanism is new in design, and gives a wide range of feeds that fully covers all requirements of modern milling practice. The gearing is all spur gears with properly proportioned bearings, thus reducing the loss of power by friction and insuring an unusually high efficiency. The feed changes are obtained by the simple movement of a lever and index slide. The drive is from the machine pulley shaft by chain and sprocket wheels, and as this shaft runs at a constant speed, it is possible to obtain a table feed that is independent of the spindle speed, thus giving a fixed rate of correct feeds in inches per minute, in relation to the spindle speeds, for all diameters of cutters. The range of feed obtainable with this mechanism varies from ½-in. to 6-in. per minute, which gives for small mills a range from .001-in. to .016-in. and for large mills .033-in. to .400-in. per revolution of spindle. Another feature of importance is that the table feeds and spindle speeds are in geometrical progression, which is recognized by the leading engineers as the most satisfactory for this class of machine tools.

THAWING WATER PIPES BY ELECTRICITY.

Unusual trouble from the freezing of water mains and service pipes has been reported from many cities and towns, both in Canada and the United States, and the Canadian Engineer has had enquiries from both sides of the line as to a method of thawing pipes by electricity briefly described in our issue of February, 1903. As the Ottawa Electric Co. has frequently come to the relief of the Capital City, which has suffered much during the past winter from the severe frost we give below details of the method employed there, as kindly furnished by A. A. Dion, general superintendent, in reply to our enquiries:

"Regarding the thawing of pipes by electricity, I think we were the first in Canada to do it, though I believe it had been done at one place in the United States before, that was four years ago. This year the cold has been so severe that the city has not been able to cope with the trouble of frozen pipes with the ordinary means at hand, such as steam boilers mounted on sleighs, etc. If the freezing has extended into the street they can do little and that only at a great expense. The City Engineer having asked for our assistance, we rigged one of the company's express sleighs for the purpose. Four transformers of 5,000 watts each were put in this sleigh and connected two in series on their primary side. The secondary connections were such that when the transformers were attached to the line wires by means of small flexible rubber covered cable, each transformer got half the primary voltage for which it was made, and the secondary voltage was about 25 volts. The normal current capacity of the secondaries as connected was 400 amperes. We also had a rheostat in series with the primary cables and an ammeter. A board about 6 ft. long was set upright in the sleigh, on this a shelf was attached for the ammeter and a cross piece at the top