

may be limited and a very open scale provided at the normal degree of temperature. These thermometers have been in successful

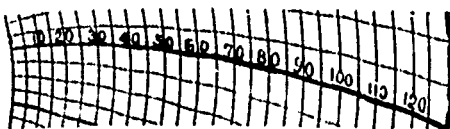
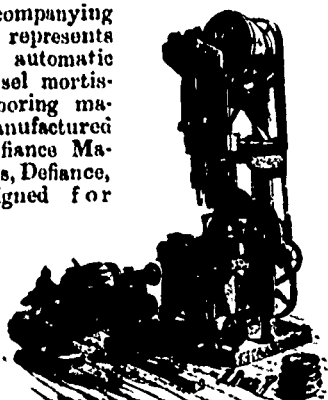


Fig. 3.

operation for several months. They are being manufactured and placed on the market by The Bristol Company, of Waterbury, Conn.

HUB MORTISING MACHINE.

The accompanying illustration represents a patent automatic double chisel mortising and boring machine, manufactured by the Defiance Machine Works, Defiance, Ohio, designed for automatically mortising hubs from the smallest up to eighteen inches diameter,



cutting the mortises straight or stagger at the rate of 400 hubs per day. It is equally well adapted for cutting mortises of the regular kind in hard or soft wood, from one-eighth of an inch to two-and-a-quarter inches wide, to five-and-a-half inches long, such as required in wagon, carriage, furniture and agricultural implement shops, and when not engaged in mortising, the boring spindles may be utilized as a regular boring machine.

This machine is calculated to do four distinct classes of work, hub mortising, regular carpenter mortising in straight work, and as a general boring machine, for vertical and horizontal boring; and it also has the advantage of doing the work more perfectly, and six times faster than it can be accomplished with a single chisel-machine.

The frame is a heavy casting in one piece, with the driving power at the top. It has two chisel bars arranged side by side upon the front of the column, their axes being on a vertical plane at right angles to the axis of the main shaft, and they are adjustable to give the mortises desired dish and taper.

The horizontal boring spindle is conveniently fitted through the main frame with a universal chuck for holding the auger, having adjustments to bore holes for straight or stagger mortises, and it is intended for hub work, and general boring.

In mortising hubs the attachment, as shown on the floor, is used; it holds the hub at one end in a three-jawed universal chuck, the other end turning in a taper cup. The weight of the operator's foot upon the treadle at the base of the machine instantly starts the chisel bars, and the table carrying the hub is gradually lifted to the chisels until the full depth of cut is reached, when it remains stationary until the mortise is complete, when it descends, the hub turning one notch of the index plate ready for the next mortise, and it is again presented to the action of the chisels, and so continuing until all of the mortises are finished. The jiggling, spacing, feeding, etc., are entirely automatic in their movements, and all of the adjustments are of the simplest character.

For straight mortising the table on which the timber rests has a screw clamp for holding the work; it has a longitudinal and transverse (right angular) adjustment for regulating the position of the mortise to be made, and the work is automatically presented to the action of the chisels as explained above. Six thousand medium sized mortises in soft wood can be cut in ten hours without a variation in the dimensions of the mortises of one-thousandth of an inch from a specific measurement. It will make mortises tapering in either direction or parallel, as desired, or tapering at one end, and perpendicular to the surface at the other end. No painstaking, difficult, and uncertain jiggling of a carriage is required, and no reversing of chisels.

The vertical boring apparatus is contained within an iron case completely covering the gears, and so constructed that the centre of the auger is always exactly in line with the centre of the chisels, so that the object, after being bored, has only to be moved horizontally to bring in proper place under the chisels to receive the mortises. The boring spindle has a radial adjustment for boring holes to any angle.

The friction drive pulley is twenty four inch diameter, six-inch face, speed 300 rotations per minute.

For further information enquire of the Defiance Machine Works, Defiance, Ohio; or estate of T. I. Coleman, Searforth, Ont.

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THE NEW STEEL ARCH BRIDGE ACROSS THE NIAGARA RIVER.

The new steel arch bridge to replace the railway suspension bridge across the Niagara river, and which was given the official test July 29th last, is one of the largest bridges of its kind in the world. The main span measures 550 feet between the centres of the end piers. The measurements of some of the other great arches of the world are as follows:

Louis I, Oporto, Spain	566
Garabit, France	543
Pia Maria, Portugal	525
Washington bridge, New York	510
Eads, St. Louis, Mo.	520
Palermo, Italy	492
Rochester, N.Y., below lower falls	428

The work was commenced late last fall, and has gone on since without loss of life or serious accident. The arch rests on four abutments of masonry, two on each side of

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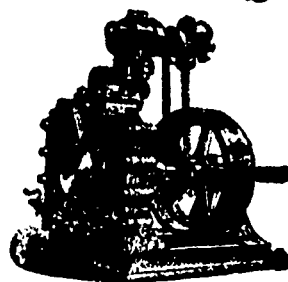
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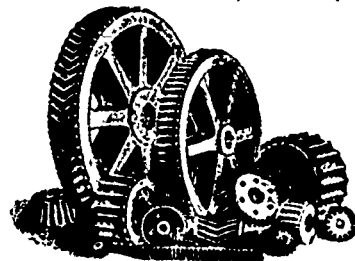
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