

to forming and finishing the various parts, the operations of mortising, boxing, tanging, and boring are all accomplished by machinery, designed and built for the purpose by Messrs. Sagar, of Halifax, and other makers of woodworking machinery. The work of these machines is done so accurately that the wheelmaker has only to fit the various parts together and wedge the felloes up ready for tiring.

Hub-Turning Machine.—In Fig. 46 is shown a hub-turning machine, used for making hubs up to 16 inches in diameter. A piece of rough round timber is first bored in a separate machine, and is then placed on special centres *a* and *b* which are carried on the headstocks *c* and *d*. The former of these, known as the *fast headstock*, is secured permanently to the bed *e*; the latter, known as the *loose headstock*, can be moved along the bed and fixed in any position to suit the length of the hub. This headstock *d* is also called the *tail-stock*. At the back of the machine are revolving cutters which shape the hub *f* as the latter revolves at a uniform speed. The cutters, which are made to revolve rapidly, are moved to and from the hub by means of the hand wheel *g*, and by means of adjustable stops the travel of the cutters can be set to make any number of hubs of exactly the same size. When finished, the hub is removed by turning the hand wheel *h*, which withdraws the centre *b* and allows the hub to be lifted out.

Hub-Mortising Device.—The mortises in the hubs are cut on a power mortising machine by means of the special attachment

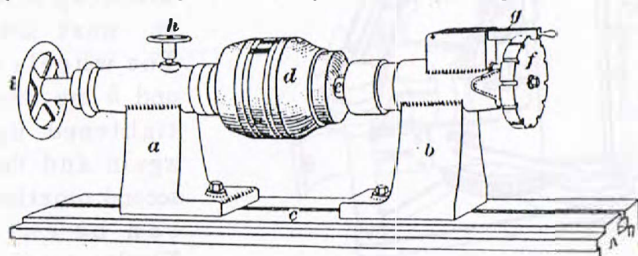


FIG. 47

illustrated in Fig. 47. The machine itself is of the kind already described in *Shop and Mill Equipment*. In Fig. 47 the headstocks *a* and *b* are bolted down on the bed *c* of the machine, and

the hub *d* is held between the centres in such a manner that when it is turned the spindle *e* turns with it. At one end of this spindle is a *dividing wheel* *f*, which is a metal disc having on its edge as many slots as there are mortises to be cut in the hub.

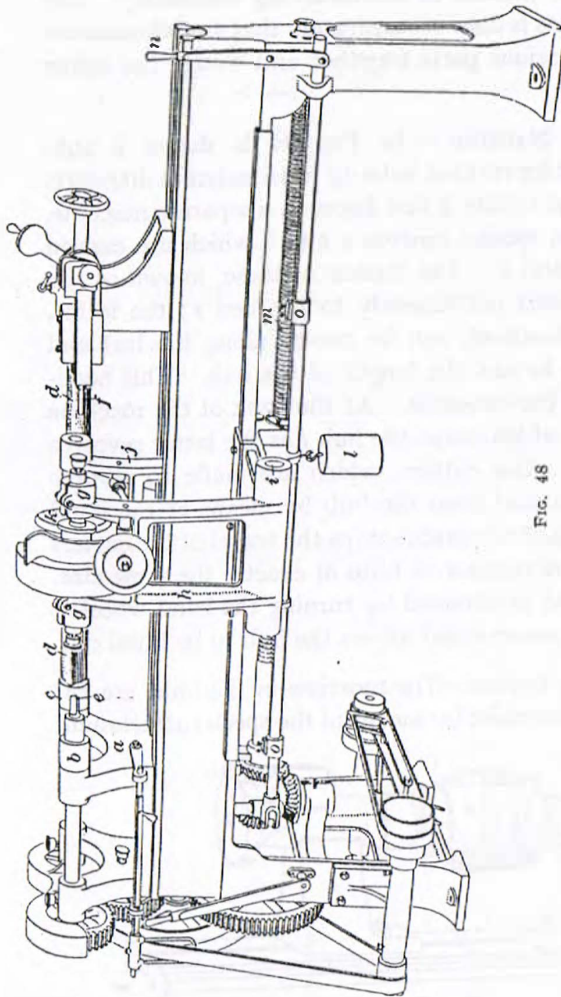


FIG. 48

These slots are spaced at equal distances apart, and a latch *g* fits into the top-most slot and prevents the hub from turning while the mortises are being cut. When the first mortise has been cut, the small lock-wheel *h* and the spindle wheel *i* are slacked back, and the latch *g* raised; the hub is then turned by hand until the latch will drop into the next slot. The wheels *i* and *h* are then tightened up again and the second mortise can be cut.

These operations are repeated until all the mortises are cut, thus saving the time that would otherwise be spent in setting out and spacing them. The illustration shows two mortises already cut,

the only marking off being the four circumferential lines which indicate the ends of the mortises. These are readily scribed on with a pointed tool when the hub is in the lathe.

Copying Lathe.—The spokes are formed in what is termed a copying lathe, or copying machine, an example of which is shown in Fig. 48. The fast headstock *a* has two spindles *b* and *c*, which are driven off the same gearing, and revolve together at the same uniform speed. A pattern *d* of the spokes required is fitted between the headstocks and revolves along with the back spindle *c*. The piece of wood from which the spoke is to be made is held between the centres *e* and *f*, and revolves with the front spindle *b*. The cutter spindle revolves in bearings *g* on the rocking bracket *h*; this is pivoted at *i* and is connected to a similar bracket *j*, so that both move together. At the top of *j* is a wheel *k* which is held up against the pattern *d* by the action of the weight *l*; this wheel is free to revolve on its shaft. When the machine is started, the pattern *d* revolves and, since it bears against *k*, moves the latter to and fro in accordance with the shape of *d*. As the bracket *j* which carries the cutters has the same motion as the bracket carrying the wheel *k*, the cutters will make the spoke of the same shape as the pattern. A revolving screw *m* works in the base of the brackets and causes them to slide longitudinally, so that the cutter passes over the full length of the spoke. After once being set for any required size, all the spokes made on this machine will be exactly alike. The travel of the cutter can be reversed by moving the handle *n*, or the machine will reverse automatically when the brackets come in contact with the stops *o*.

Tanging and Boring Machine.—The tenons on the spokes may be cut either with a band saw or in a tenoning machine similar to that described in *Shop and Mill Equipment*. When the spokes have been driven into the hub, the tangs are cut in a tanging machine, one of which is illustrated in Fig. 49. The hub *a* rests on a circular plate, the height of which can be adjusted by turning the nuts *b* on the screw *c*, which passes through the hub. Each spoke *d* is in turn held between the jaws *e* and *f*, the height of *e* being adjusted by means of the hand wheel *g*, while *f* is screwed down by turning the hand wheel *h*. A hollow

auger *i* is fitted on a revolving spindle *j*, which is driven by a belt on the pulley *k* and can be moved to and from the spoke by means of a lever *l*. The position of the sliding piece that carries the screw *c* can be adjusted to suit wheels of various diameters by turning the wheel *m*, and the length of the tang is regulated by the position of the stop *n*.

The machine here illustrated can also be used for boring the felloes. For this purpose the jaw *e* is removed and the felloe

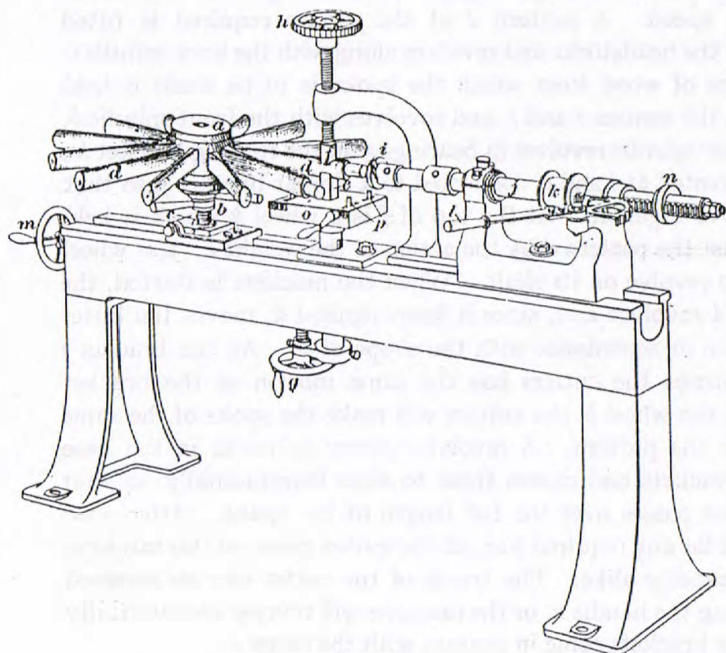


FIG. 49

to be bored is laid on the table *o*, where it is clamped between the adjustable pins *p*. The table is then raised to the required height and the felloe further secured by the jaw *f*, or by a plate that may be substituted for it. The boring is done with a bit, fitted in place of the hollow auger *i*.

Wheel-Turning and Boxing Machine.—The machine shown in Fig. 50 is used for turning or finishing the rims or felloes, and also for boxing out the hub to receive the axle bush. The dished face plate *a* is mounted on a spindle and is driven by a belt on

one of the pulleys forming the step cone *b*. These pulleys are of different diameters in order to vary the speed of rotation. The wheel is fastened to the face plate by three bolts and thumb nuts *c*, each bolt passing through a flat piece of wood *d* which is long enough to go across two adjacent spokes. The thumb nuts are not screwed up tightly until the wheel has been centred and runs truly. This is effected by means of a self-centring device, not shown, which is fitted to the face plate.

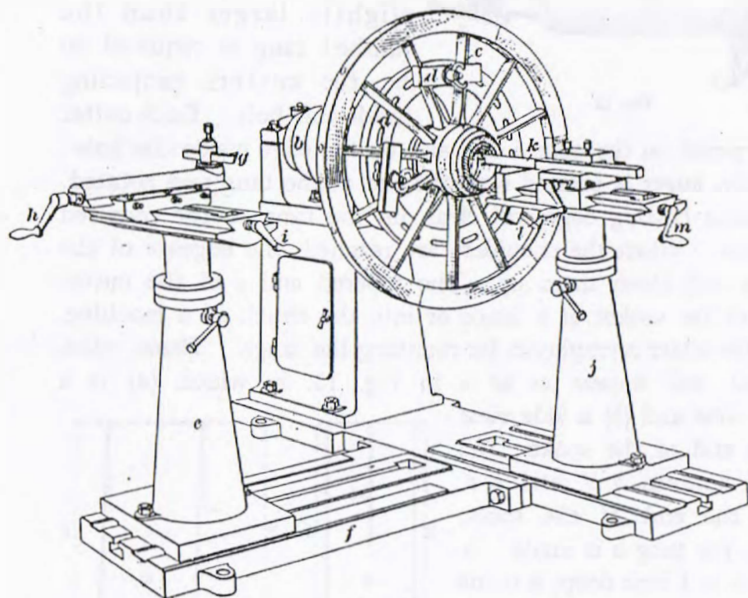


FIG. 50

To turn up the rim, the pillar *e* is moved along the bedplate *f* until the cutting tool *g* is close to the rim. The machine is then started, and as the wheel revolves the tool is passed over the sides and the sole of the rim by turning the handles *h* and *i*. For boxing out the hub the pillar *j* carries a boring bar *k*, at the end of which a cutting tool is fitted; the movements of the tool are controlled by the handles *l* and *m*. When the front of the hub has been boxed out the wheel is taken off and reversed, and after it has been centred on the face plate again the back portion of the hub is boxed out.

60. Felloe-Shaping Machine.—In the manufacture of exceptionally heavy wheels, such as are used on large motor-traction vehicles designed to carry heavy loads, it is generally necessary to use machinery of a special class. These wheels are always of the artillery type, with forged steel hubs and strong wooden spokes; these latter are turned in a large copying lathe. The tangs should not be less than $1\frac{1}{2}$ inches in diameter; in some cases they are made square and are fitted into square mortises in the felloes. The latter, which may be as much as 12 inches wide, are made in a felloe-shaping machine, an example of which is shown in Fig. 51.

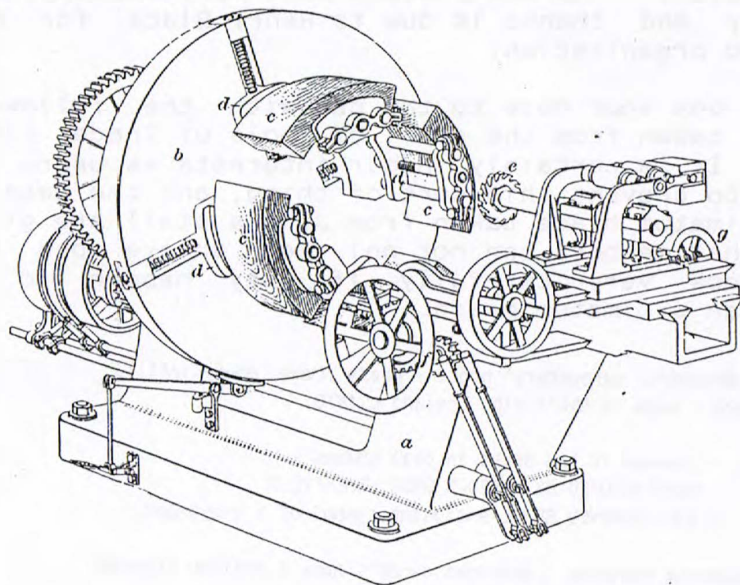


FIG. 51

This machine consists of a heavy cast-iron frame *a*, at one end of which is a headstock that carries the face plate *b*. The felloes *c*, from one to four in number, can be secured to the face plate by means of centring clamps *d*; the felloes are dressed to the exact curve required by a rapidly revolving cutter *e*, which removes the surplus wood as the face plate revolves. The felloes are first put inside the clamps and the inside faces cut to the required radius; the felloes are then put outside the clamps for the outsides

to be finished, as in the illustration. The wheels *f* and *g* are used for adjusting the position of the cutter *e*.

Hydraulic Tire Press. — When the felloes have been removed from the shaping machine, mortised or bored, and driven on to the spokes, it should not be necessary to turn them up in the finishing lathe, but a little smoothing may be necessary before the tire is fitted on. Owing to the thickness of the steel tires used on the heaviest type of vehicles, it is not the practice to shrink them on, as they would char the wood before they could be cooled, and hence result in future looseness. Instead, they

are forced over the rim in a powerful hydraulic press similar to that shown in Fig. 52. The tire *a* is laid on a level table *b*, where it is centred and held by the jaws *c*. The wheel *d* is attached to a rod *e*, and by means of the wire rope *f* and the windlass *g* the wheel is held against the face of the upper plate *h*, on which it is centred. The table *b* is secured to a ram that works in a hydraulic cylinder *i*; when water under pressure is admitted to the cylinder the table rises, carrying with it the tire *a*, which is forced over the rim of the wheel with a pressure of several tons.

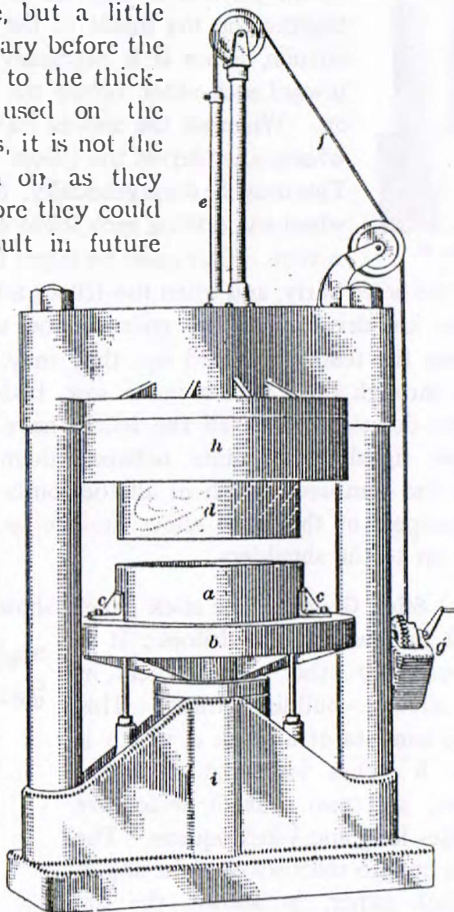
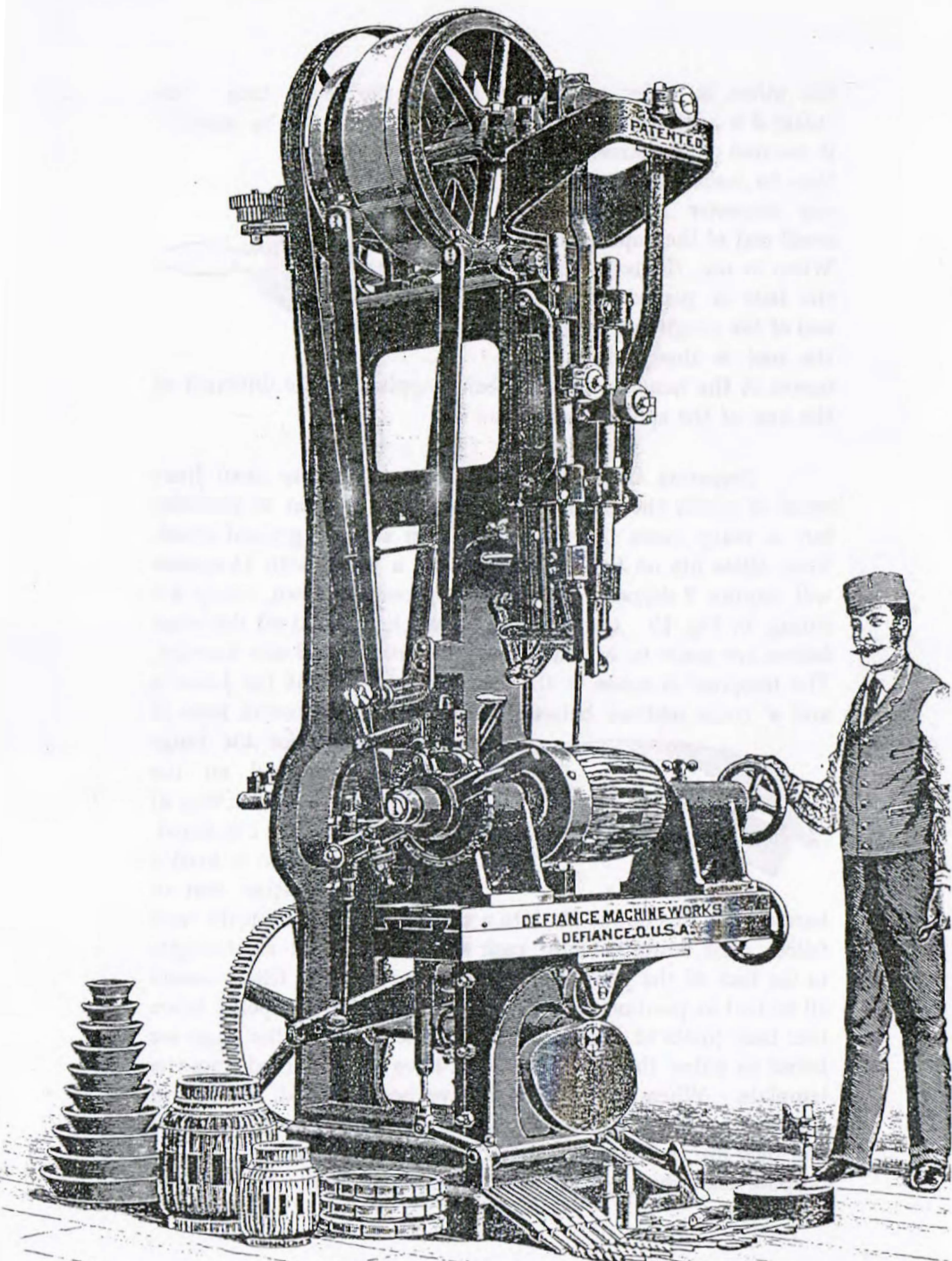


FIG. 52



No. 2 Patent Automatic Double Chisel Hub Mortising Machine.

Export Shipping Weight, 6,300 Pounds.

Net Weight, 5,100 Pounds.

Cubic Measurement, 266 Feet.

Cable Word, MANITOBA.