W. H. DAVIS.

Spoke Tenoning Machine.

No. 232,340. Patented Sept. 21, 1880.

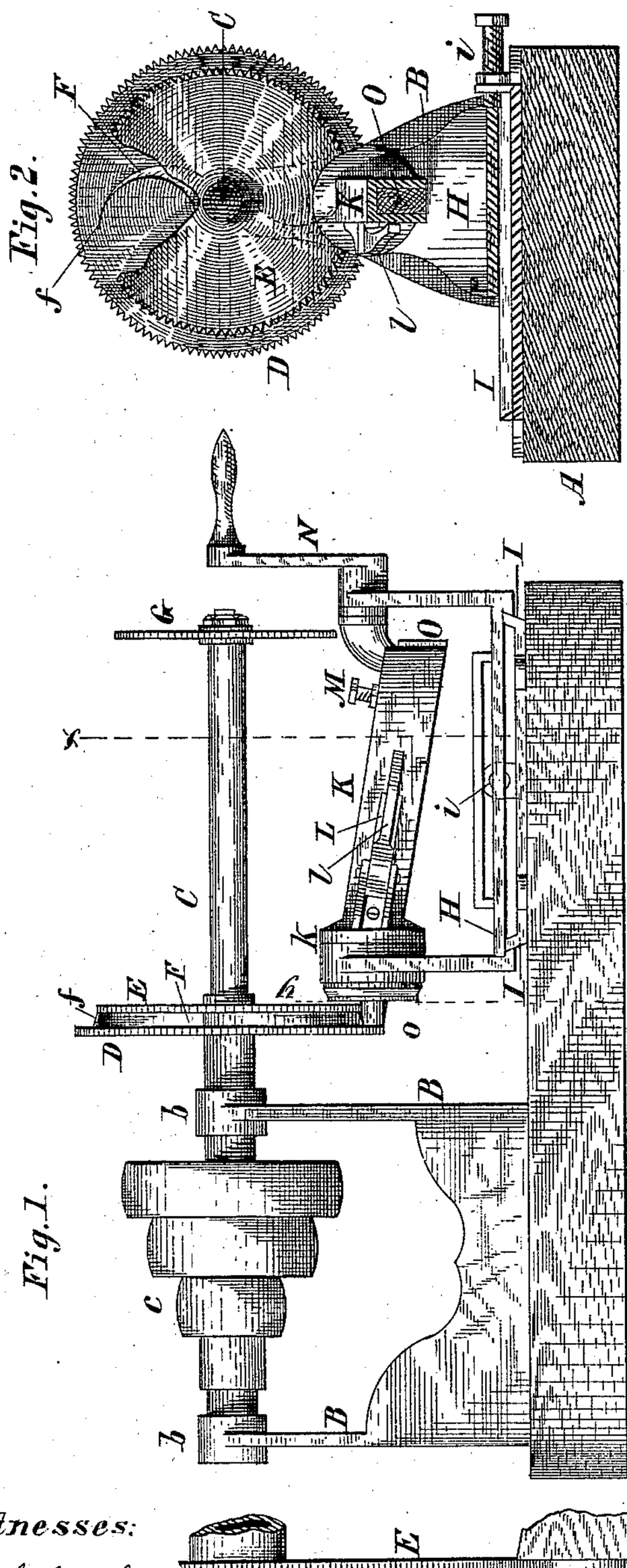

Fig. 1.

Fig. 2.

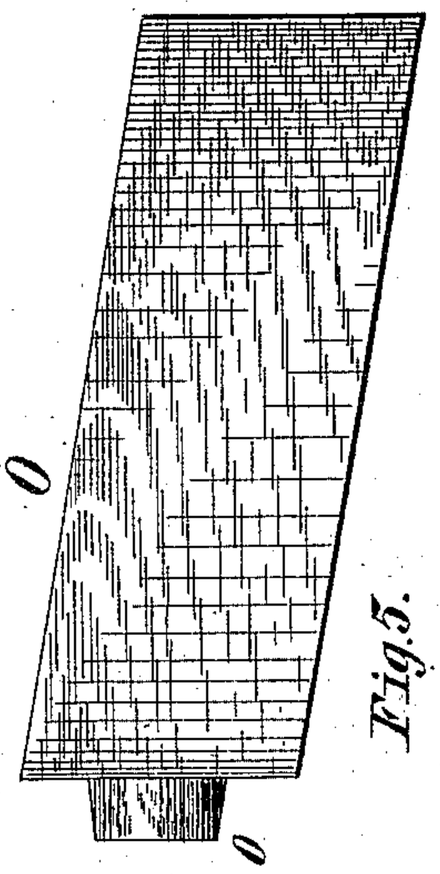

Fig. 5.

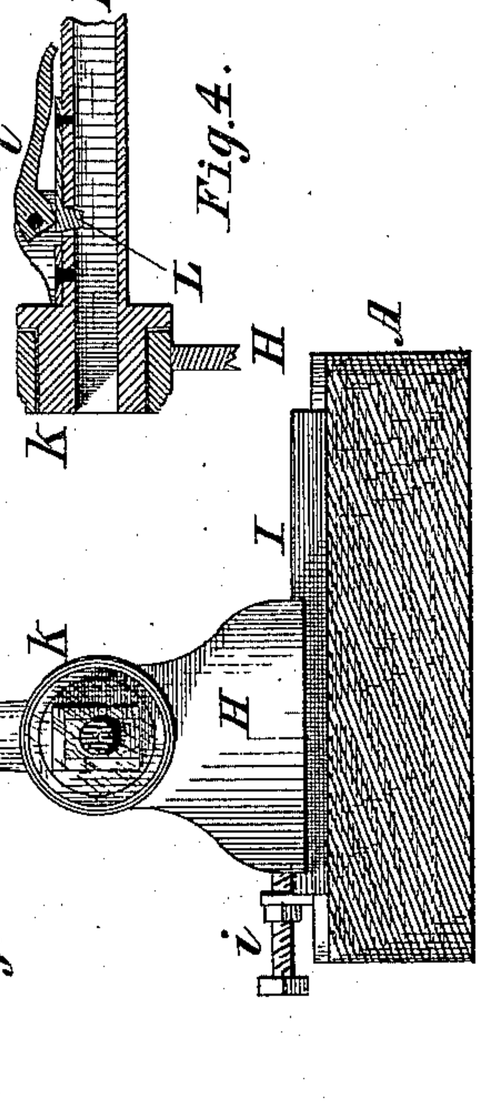

Fig. 4.

Fig. 3.

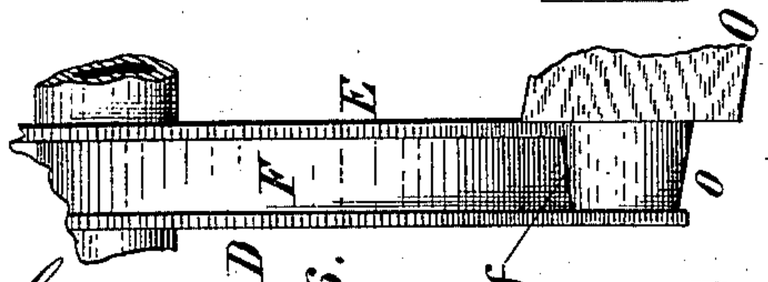

Fig. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM H. DAVIS, OF MINNEAPOLIS, MINNESOTA.

SPOKE-TENONING MACHINE.

SPECIFICATION forming part of Letters Patent No. 232,340, dated September 21, 1880.

Application filed November 17, 1879.

To all whom it may concern:

Be it known that I, WILLIAM H. DAVIS, of Minneapolis, in the county of Hennepin and State of Minnesota, have invented a new and useful Improvement in a Spoke-Tenoning Machine, which is fully described in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 represents a front elevation of a machine embodying my improvements; Fig. 2, a transverse section of the same, taken on the line *x x*, Fig. 1; Fig. 3, an end elevation of the spoke-holder, taken on the line *y y*, Fig. 1, and looking toward the tenon end of the spoke and holder; Fig. 4, a longitudinal section of a portion of the spoke-holder and its inner bearing; Fig. 5, an elevation, on an enlarged scale, of a spoke with the tenon formed; and Fig. 6 a front elevation, on an enlarged scale, of the tenoning saws and cutter.

My invention relates to a machine for cutting a tenon on one end of a spoke at any desired angle, and at the same time cutting off the other end at the proper length and on the same angle as the tenon-face of the spoke, the parts being constructed and arranged so as to make all the tenons of precisely the same length and slightly tapering.

The invention consists in various devices and particular combinations of devices, all of which will be hereinafter fully described, and pointed out definitely in the claims.

In the drawings, A represents the base on which the machine is mounted, which may be any support suitable for this purpose. An upright frame, B, is securely fastened in any suitable manner to this support, and is provided at its upper end with bearings *b*, adapted to receive a shaft, C, on which are fixed pulleys *c* of different sizes, by means of which the shaft may be rotated at different speeds. This shaft is projected from the inner end of its bearing-frame and carries near its inner bearing two circular saws, D and E, of different diameters, the difference between the diameter of the outer or larger saw, D, and that of the inner or smaller one, E, being equal to twice the diameter of the tenon which it is desired to form on the end of the spoke. These two saws are also arranged a short distance apart on the shaft, the distance between the inner face of the larger and the outer face of the smaller saw being equal to the length of the tenon desired for the spoke.

A cutter, F, is fixed to the shaft between the two saws D and E, being wide enough to fill the entire space between the two. This cutter may be single-bladed, double-bladed, as shown in the drawings, or, if desired, may have even more than two blades. The outer or cutting edges, *f*, of the blades are inclined slightly outward from the inner or the outer saw, as shown in Fig. 6 of the drawings, for a purpose which will presently be described.

On the extreme outer end of the shaft C a third saw, G, is mounted, the distance between it and the larger saw D being equal to the length of the spoke with its tenon. This saw is for the purpose of cutting off the hub end of the spoke, and, as will presently be seen, may be of smaller diameter than either of the saws D and E.

A frame, H, is arranged underneath the extension of the shaft C, and is mounted on ways I, attached to the base A, so that it may be reciprocated back and forth underneath the saws, and at the rear side of the machine is an adjustable stop, *i*, (shown in the drawings in the form of a screw,) by means of which the inward movement of the sliding frame may be regulated.

A spoke-holder, K, is mounted in suitable bearings on this reciprocating frame. This holder is arranged at an inclination to its axis of rotation, the angle of inclination being about the same as that usually adopted in setting spokes in the hub of the wheel, as shown in Fig. 1 of the drawings. The holder is open at one edge, so as to give it a grooved or channeled appearance in cross-section, and the other end is open, while the inner end is made to form a closed journal, *k*, adapted to the inner bearing on the reciprocating frame, which journal is mortised to permit the end of the spoke to pass through it.

On one side of the holder is a spring-clamp, L, the clamping end of which projects through the side of the holder so as to bite the spoke, and above this clamp is a pivoted cam-lever, *l*, constructed and arranged so that when de-

pressed or turned down it will force the clamp against the spoke for the purpose of holding the latter firmly in position.

A setting-screw, M, is inserted in the lower side or edge of the spoke-holder and near the outer end thereof, by means of which the spoke may be set in the holder so as to vary the angle of inclination which it holds to the axis of rotation.

A crank, N, is attached to the outer end of the holder, by means of which it may be rotated. The movement of the reciprocating frame is intended to be regulated so that it can be stopped when the axis of the spoke-holder is in about the same vertical plane as the axis of the saws above.

The operation of this machine is as follows: The saws being set in revolution and a spoke, O, placed in the holder, with one end projecting from the mortise at the inner end of the latter and secured in place by the clamp, the reciprocating frame is pushed underneath the saws by the attendant, who at the same time gives the spoke-holder a single revolution by means of the crank N.

Now the height of the bearings of the spoke-holder is such that the smaller saw E will cut down to a suitable distance in the projecting end of the spoke to cut around a tenon, *o*, on the projecting end thereof, and it is evident, from the description given above, that the larger saw D will at the same time cut off the end of the spoke, leaving the length of the tenon, while the cutters F will remove the wood between the two saws, thereby, with the saws, forming a perfect tenon, *o*, on the end of the spoke, which will be slightly tapering, as shown in Fig. 5 of the drawings, on account of the inclination of the cutters. (Shown in Fig. 6 of the drawings.)

It will be seen that the tenon stands at an angle to the axis of the spoke, and is therefore in proper position to enter the socket in the felly. During this operation the outer end of that spoke will be turned up by the revolution of the holder against the outer saw, G, and cut off at the same angle as the face of the opposite or tenon end.

It will be seen that thus uniformity in the size and length of the tenons is secured, and also in the length of the spokes. With this construction the holes or sockets in the felly may be bored the exact depth of the length of the tenon, thereby insuring a seat for the tenon at the bottom of the socket, as well as at the shoulder of the spoke, which assists in preventing the spoke from penetrating the felly when in use, and the tenon being slightly tapered, a snug fit in the felly-socket is insured.

It will be noticed, also, that the work is done on the working side of the center of the machine, and not under the center, so that the size of the tenon may be accurately regulated by means of the adjusting device which regulates the movement of the reciprocating frame, and also that a single revolution of the spoke-holder as it is carried against the saws completes the entire work.

Instead of the crank for rotating the holder, a gear-wheel may be placed on the shaft of the holder, and driven by another gear-wheel on the saw-shaft, the gear-wheels being engaged by the moving up of the frame to the saws, and disengaged by the opposite movement, thereby making the machine automatic in operation. A pulley and belt mechanism could also be arranged to rotate the spoke-holder as it is fed to the saws. If desired, the outer saw, G, might be made adjustable on its shaft to a limited extent, to adapt it to spokes of different lengths. If desired, the devices for securing and adjusting the spoke in the holder may also be of different construction, as any devices suitable for this purpose may be applied.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a tenoning-machine, an inner cutting-saw, E, in combination with an outer cutting-saw, D, of a radius exceeding that of the former by the diameter of the tenon, a cutter, F, arranged between the two, and an inclined rotary spoke-holder, whereby the tenon is formed and cut off at the outer end simultaneously, substantially as described.

2. An inner cutting-saw, E, in combination with an outer cutting-saw, D, the radius of which exceeds that of the former by the diameter of the tenon, a cutter, F, arranged between the two and having its cutting-edge inclined outward from the smaller to the larger saw, and an inclined rotary spoke-holder, substantially as and for the purpose set forth.

3. The tenon-forming device consisting of the saws D and E and cutter F, in combination with the third saw, G, all mounted on the same shaft, and a revolving spoke-holder, K, all arranged and operating substantially as described.

4. In a spoke-tenoning machine, a rotating spoke-holder inclined to its axis of rotation, in combination with the tenoning devices, substantially as described.

5. In a spoke-tenoning machine, a rotary spoke-holder inclined to its axis of rotation, in combination with a horizontally-reciprocating frame upon which it is mounted and tenon-forming devices to which the holder is fed by the reciprocation of the frame, substantially as and for the purpose set forth.

6. In a spoke-tenoning machine, the rotary spoke-holder K, inclined to the axis of its revolution, in combination with the spring-clamp L, projecting through the side thereof, the cam-lever *l*, for operating the clamp, and the set-screw M, inserted in the lower part of the spoke-holder and near the end thereof, substantially as and for the purpose set forth.

7. In a spoke-tenoning machine, the rotat-

ing spoke-holder K, inclined to the axis of its revolution, in combination with the reciprocating frame H, upon which it is mounted in bearings, and an adjustable stop, I, substantially as and for the purpose set forth.

8. The revolving spoke-holder K, arranged at an inclination to its axis of rotation, in combination with the reciprocating frame H, on which it is mounted, the saws D and E, cutter F, and saw G, all arranged and operating substantially as described.

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