W. E. DAVEY.

PROCESS OF REINFORCING TREES.

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958,234. Patented May 17, 1910.

Fig. 1.

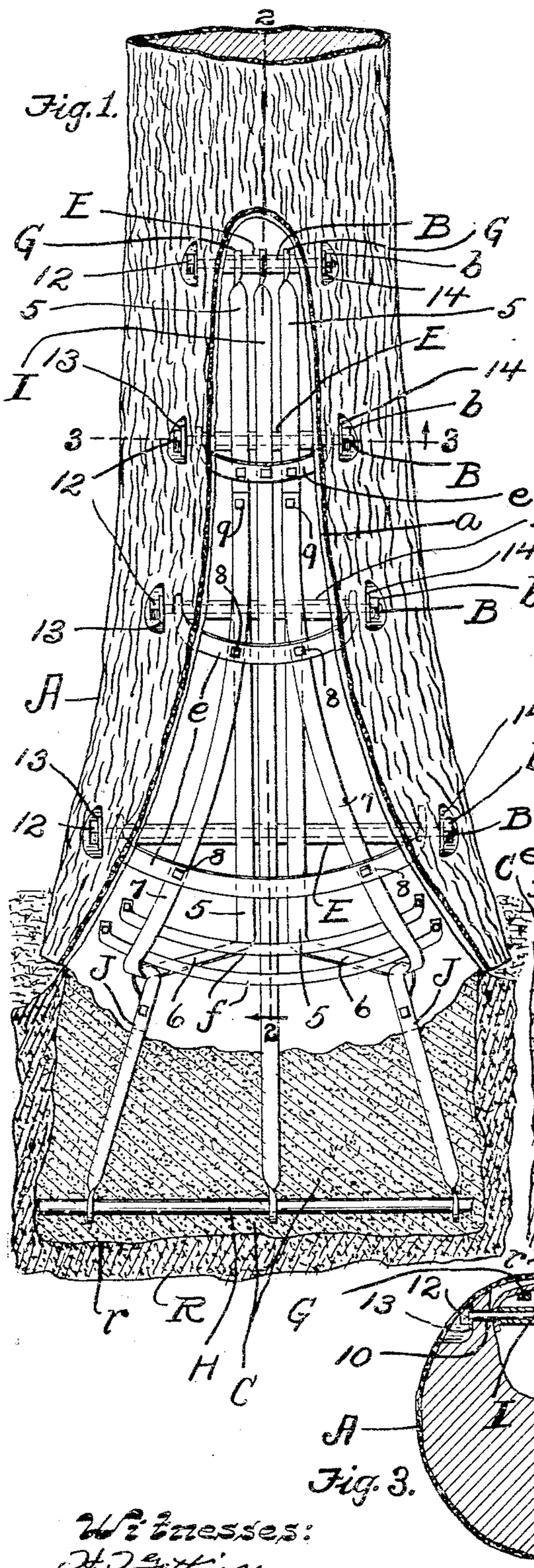

Fig. 2.

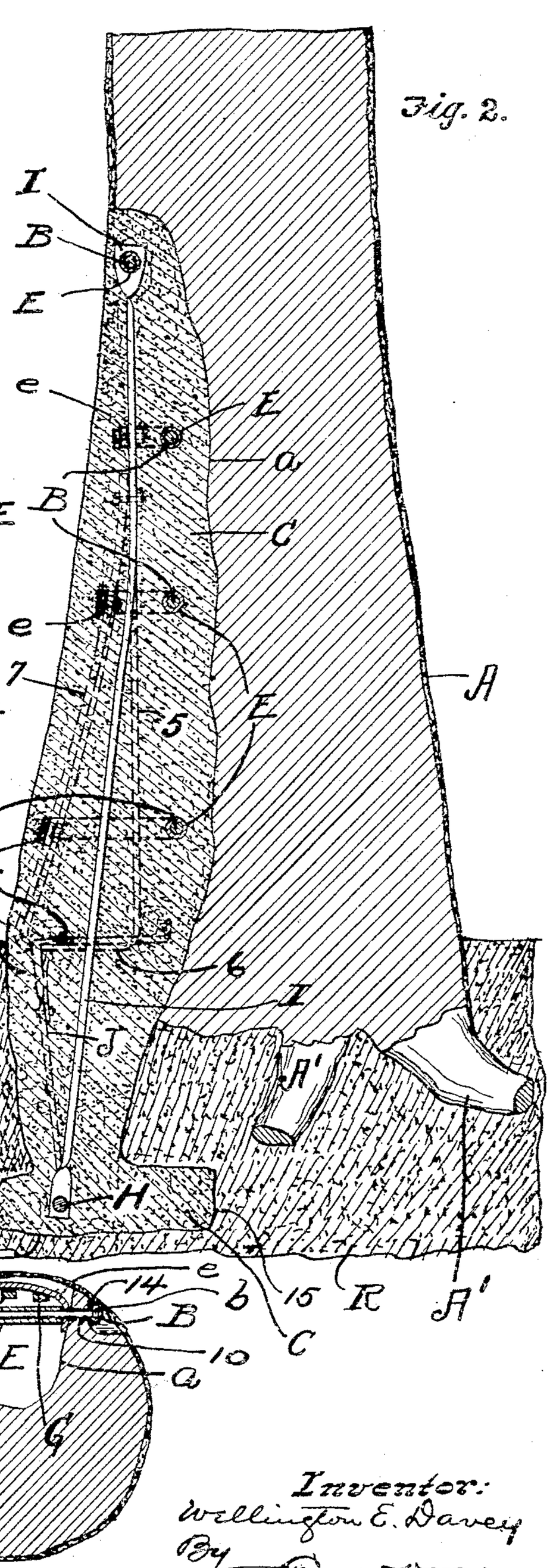

Fig. 3.

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UNITED STATES PATENT OFFICE.

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PROCESS OF REINFORCING TREES.

958,234. Specification of Letters Patent. **Patented May 17, 1910.**

Application filed April 17, 1909. Serial No. 490,579.

To all whom it may concern:

Be it known that I, WELLINGTON E. DAVEY, a citizen of the United States of America, residing at Kent, in the county of Portage and State of Ohio, have invented certain new and useful Processes of Reinforcing Trees; and I hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

This invention relates to an improved process of reinforcing a tree which has its trunk materially weakened by a hollow or cavity which has been formed in the trunk at the level of the earth or base of the trunk.

The primary object of this invention is to so reinforce the trunk that the latter will be rendered strong enough to withstand the elements.

Another object is not only to efficiently mechanically reinforce the trunk at its weakened portion, but to anchor the mechanical reinforcement to the earth.

Another object is to fill the cavity with metal-reinforced concrete and to extend the said filling downwardly into the earth and anchor the filling to the earth.

With these objects in view, and to the end of realizing any other advantages hereinafter appearing, my improved process consists in the steps hereinafter described and pointed out in the claims.

The accompanying drawings illustrate the mechanical reinforcement of the trunk of a tree, and the anchoring of the said reinforcement to the earth.

In the said drawings, Figure 1 is a perspective view of a tree-trunk reinforced by my improved process, and in this figure portions are broken away and in section to more clearly show the construction. Fig. 2 is a vertical section on line 2—2, Fig. 1, looking in the direction indicated by the arrow. Fig. 3 is a horizontal section on line 3—3, Fig. 1, looking upwardly.

Referring to the drawings, A indicates a tree-trunk which is to be reinforced by my improved process, and *a* represents a hollow or cavity which has been formed in one side of the trunk at the level of the earth and extends not only some distance above the said level but also to below the said level. R represents the earth at the base of the trunk, and A′, roots of the trunk A.

My improved process comprises a mechanical reinforcement of the trunk A, where the trunk is materially weakened by the cavity *a*, by mechanically tying opposite side walls of the cavity together at suitable points vertically and by bracing the said walls from within the cavity at suitable points vertically and thereupon anchoring the mechanical reinforcement of the trunk to the earth.

Preferably bolts B are arranged transversely of the cavity *a* at suitable points vertically. Each bolt B (see Fig. 3) is arranged substantially horizontally and extends through two holes 10 and 10 formed in opposite side walls respectively of the cavity *a*. Each bolt B bears a washer 13 which is mounted on the shank of the bolt at the outer side of one of the said walls between the respective wall and the head 12 of the bolt, and a washer 14 is mounted on the said shank at the outer side of the other of the said walls of the said cavity and between the respective wall and a nut *b* which engages the correspondingly threaded free end of the said shank. Obviously by tightening the nuts *b* on the bolts B opposite side walls of the cavity *a* are effectually tied together and spreading apart of the said walls is prevented.

On each bolt B is mounted a metal tube E within the cavity *a*, which tube extends longitudinally of the bolt, and an outwardly arched metal bar *e* has its opposite ends mounted on the said bolt at opposite ends respectively of the said tube between the tube and the opposite side walls respectively of the cavity *a*. It will be observed therefore that the end of each bar *e* operates as a washer between the adjacent side wall of the cavity *a* and the adjacent end of the tube E on which the said bar is mounted, and that the ends of the said bar and the said tube constitute means whereby opposite side walls of the cavity *a* are mechanically braced where the said walls are mechanically tied together by means comprising the bolt which extends through the said tube.

Two suitably spaced outwardly arched bars *f* are arranged within the cavity *a* below the lowermost bolt B and extend across the said cavity between opposite side walls of

the cavity and are suitably secured at their ends to the said walls.

Two metal tie-bars G are mounted upon and spaced longitudinally of the tube E which embraces the uppermost bolt B and therefore attached to and spaced endwise of the said bolt and extend substantially vertically downwardly, as at 5, from the said bolt to and below the lowermost arched bars *f* and thence outwardly under the latter, as at 6, and thence upwardly, as at 7, across the inner sides of and suitably secured, as at 8, to all of the outwardly arched bars *e* below the uppermost arched bars *e*, and the portions 7 of the tie-bars G are suitably secured, as at 9, to the substantially vertically arranged portions 5 of the said tie-bars. It will be observed therefore that through the medium of the tie-bars G and the outwardly arched bars *e* all the bolts G are tied or connected together, and the said bolts, the tubes E, the outwardly arched bars *e*, and the tie-bars G form a strong metal frame for reinforcing the hollow portion of the trunk A.

A cavity *r* is formed in the earth R next below and in registry with the cavity *a*, and the cavity *r* is enlarged laterally at its lower end, as at 15, Fig. 2.

A laterally extending metal bar H is arranged substantially horizontally within the lower portion of the cavity *r*, and an upright metal tie-bar I has its upper end embracing the tube E on the uppermost bolt B between the tie-bars G and is therefore attached at the said bolt. The tie-bar I extends downwardly from the said bolt B into the cavity *r* and is suitably attached at its lower end to the aforesaid laterally extending bar H. Also, the portions 6 of the tie-bars G are suitably attached to the said laterally extending bar H by suitably applied links J.

When the metal reinforcement formed by the bolts B, tubes E, links J and bars *e*, G, H and J, has been applied any portions of the cavities *r* and *a* not occupied by the said metal reinforcement are filled with concrete or cementitious material C, resulting in a metal-reinforced concrete filling for the said cavities, as shown in Fig. 2. It will be observed therefore that the trunk A has its cavity *a* occupied by a metal-reinforced concrete filling which extends downwardly into the earth R and the said concrete filling and consequently the metal reinforcement of the filling and opposite side walls of the cavity *a* are anchored to the earth independently of the trunk. Preferably in carrying out my improved process the concrete of the said filling is built up from the lower end of the cavity *r* to the upper end of the cavity *a* and enough concrete is applied to wholly embed the aforesaid metal-reinforcement. The metal-reinforced concrete filling forms an effective brace for the lower end of the trunk A and the brace thus formed is securely anchored to the earth.

What I claim is:—

1. An improved process of reinforcing a tree having a cavity in its trunk, said process consisting in placing a reinforcement in the said cavity, and anchoring the said reinforcement to the earth independently of the trunk.

2. An improved process of reinforcing a tree having a cavity in its trunk, said process consisting in placing a reinforcement in the said cavity and attaching the said reinforcement to the trunk, and anchoring the said reinforcement to the earth independently of the trunk.

3. An improved process of reinforcing a tree having a cavity in its trunk, said process consisting in filling the said cavity with a reinforcement and anchoring the said reinforcement to the earth independently of the trunk.

4. An improved process of reinforcing a tree having a cavity in its trunk, said process consisting in filling the said cavity with a reinforcement of metal-reinforced concrete and anchoring the metal reinforcement of the said filling to the earth independently of the trunk.

5. An improved process of reinforcing a tree having a cavity in its trunk, said process consisting in placing a reinforcement in the said cavity and attaching the said reinforcement to opposite side walls of the cavity and anchoring the said reinforcement to the earth independently of the trunk.

6. An improved process of reinforcing a tree having a cavity in its trunk, said process consisting in forming a cavity in the earth below the cavity in the trunk; filling the second-mentioned cavity with metal-reinforced concrete, and tying the trunk at its cavity to the metal reinforcement of the said filling.

7. An improved process of reinforcing a tree having a cavity in its trunk, said process comprising the building up within the cavity of a reinforcement and extending said reinforcement from within the cavity to and below the level of the earth.

8. An improved process of reinforcing a tree having a cavity in its trunk at and extending above the level of the earth, said process consisting in forming a cavity in the earth next below and in communication with the cavity in the trunk, and filling the said cavities with a reinforcement.

9. An improved process of reinforcing a tree having a cavity in its trunk at and extending above the level of the earth, said process consisting in forming a cavity in the earth and in communication with the cavity in the trunk, and filling the said cavities with metal-reinforced concrete, and anchoring

the metal-reinforced concrete filling to the earth.

10. An improved process of reinforcing a tree having a cavity in its trunk, said process consisting in bracing opposite side walls of the cavity with metal-reinforced concrete, and anchoring the said metal-reinforced concrete to the earth independently of the trunk.

In testimony whereof, I sign the foregoing specification, in the presence of two witnesses.

WELLINGTON E. DAVEY.

Witnesses:
C. H. DORER,
B. C. BROWN.