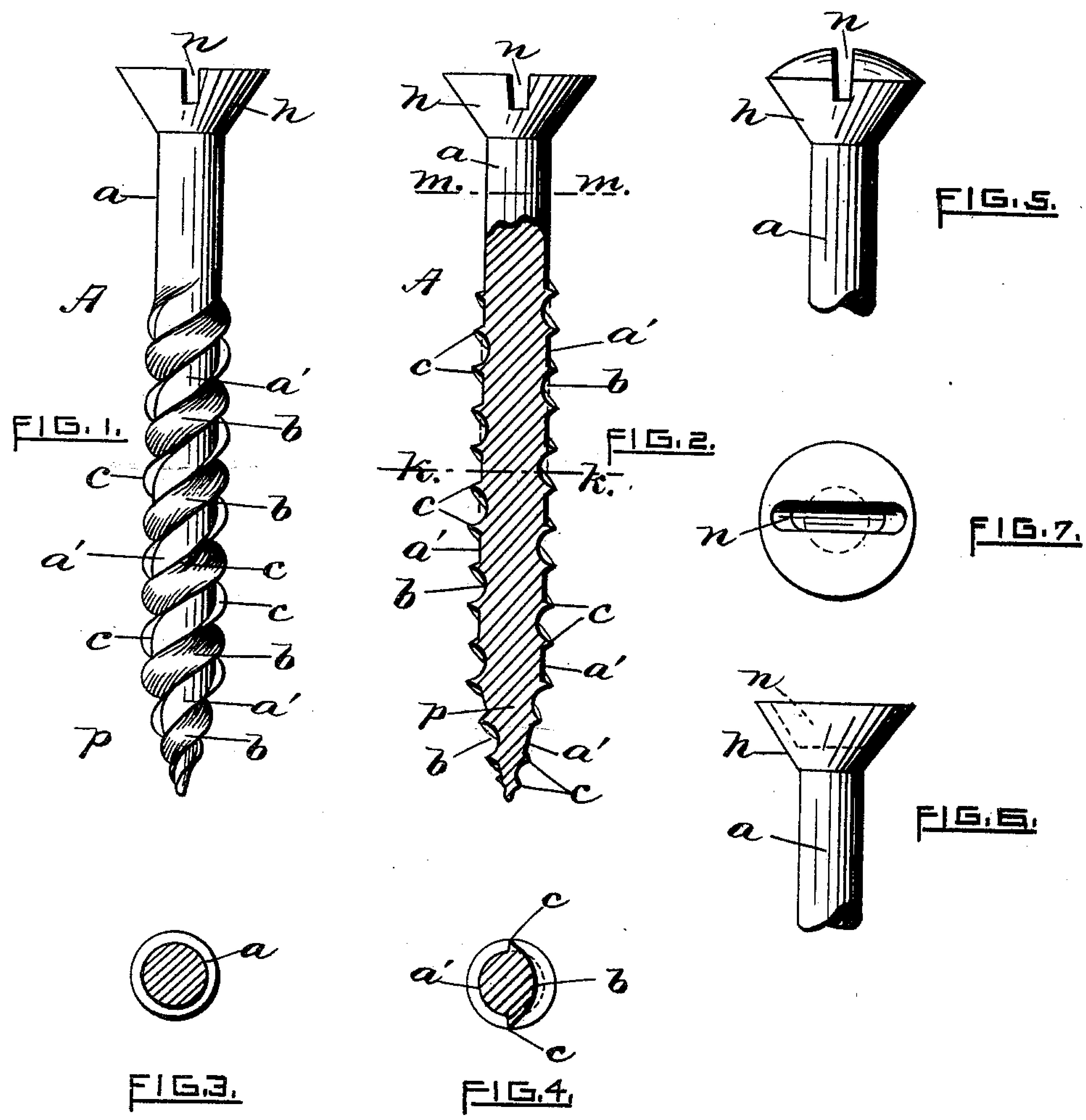
(Model.)

4 Sheets—Sheet 1.

C. D. ROGERS.

WOOD SCREW.

No. 410,697. Patented Sept. 10, 1889.



WITNESSES.

Charles Hannigan.

Herbert F. Tourtellotte

INVENTOR.

Charles D. Rogers.

by Remington & Henthorn

Attys.

N. PETERS. Photo-Lithographer. Washington, D. C.

(Model.)

4 Sheets—Sheet 2.

C. D. ROGERS.

WOOD SCREW.

No. 410,697. Patented Sept. 10, 1889.

FIG. 8.

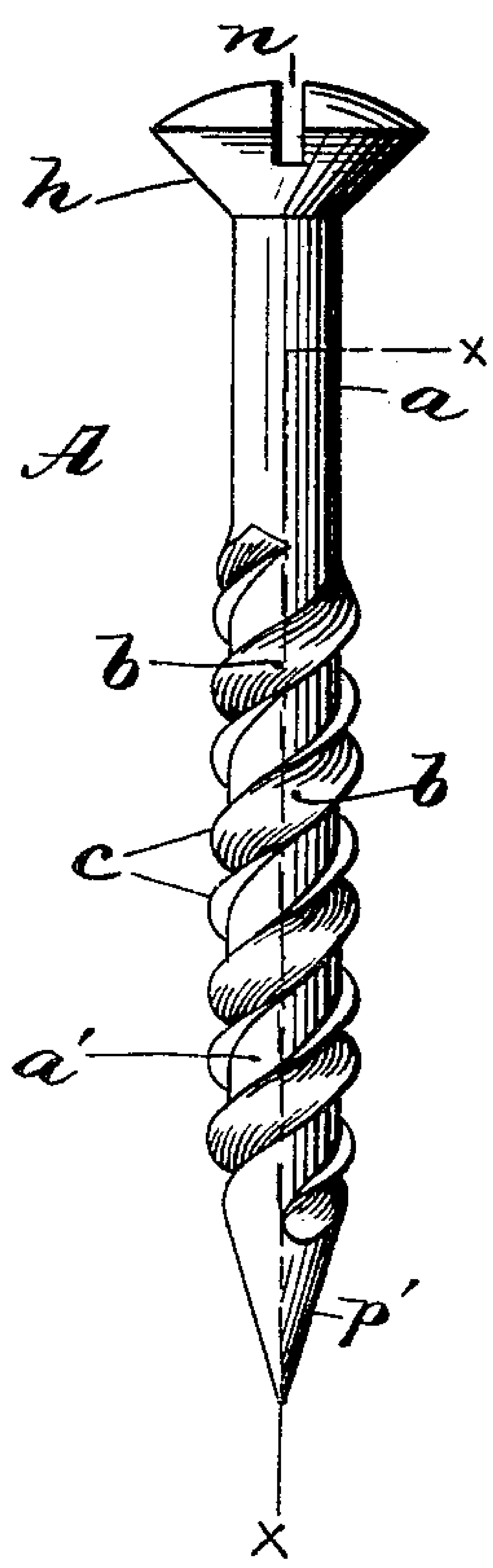
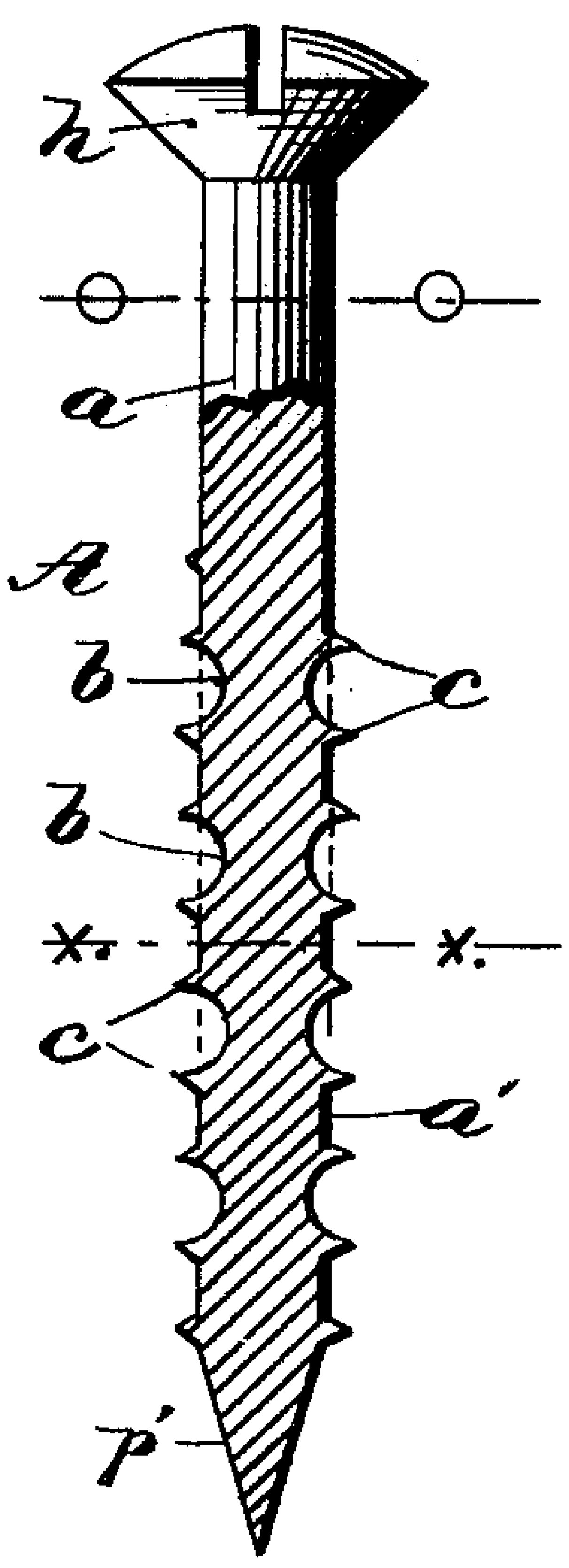


FIG. 9.



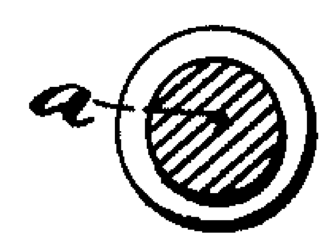


FIG. 10.

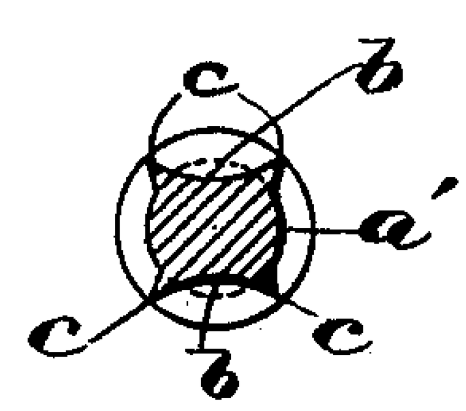


FIG. 11.

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(Model.)

4 Sheets—Sheet 3.

C. D. ROGERS.

WOOD SCREW.

No. 410,697.

Patented Sept. 10, 1889.

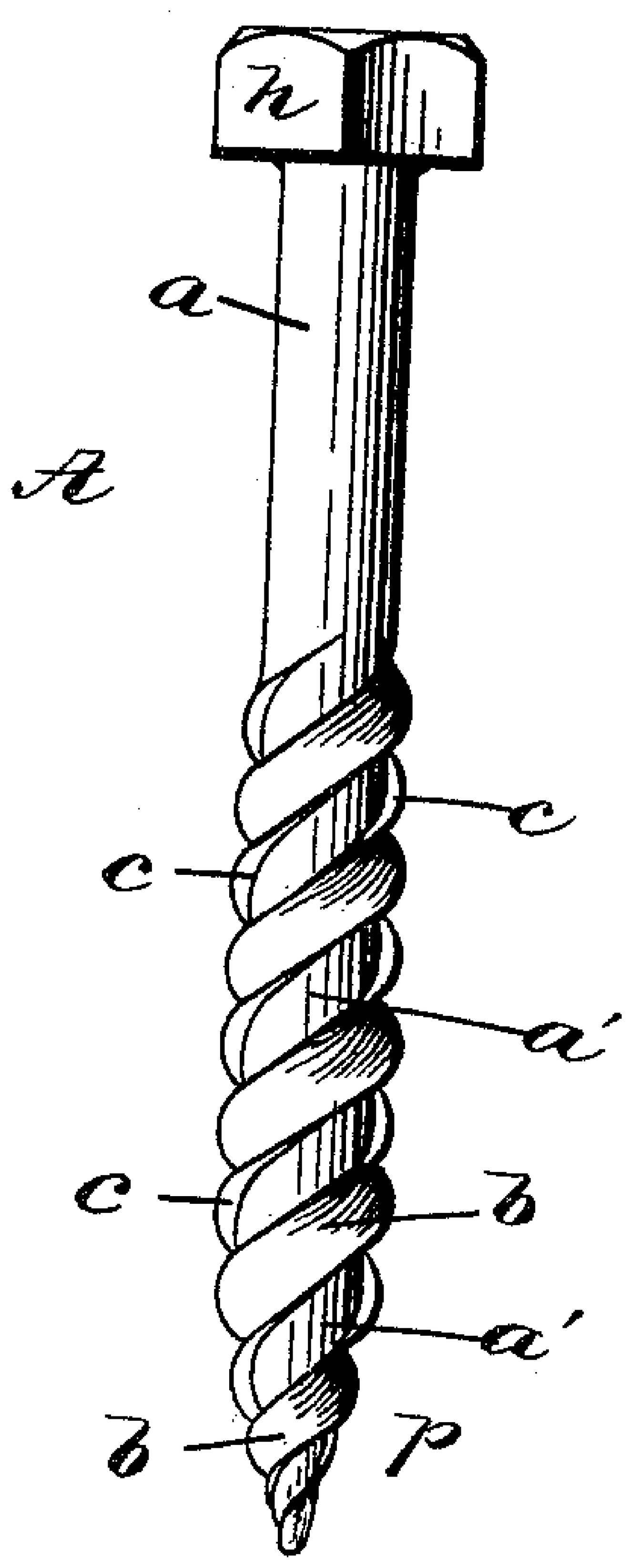

FIG.12.

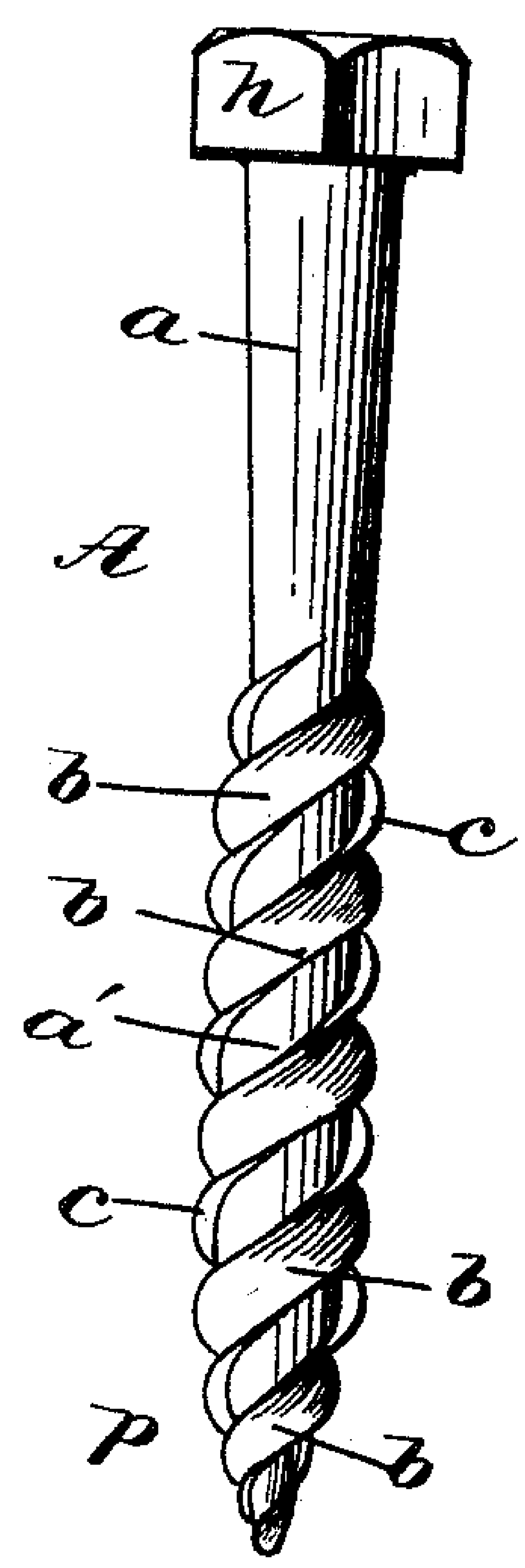

FIG.13.

WITNESSES.

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(Model.)

4 Sheets—Sheet 4.

C. D. ROGERS.

WOOD SCREW.

No. 410,697. Patented Sept. 10, 1889.

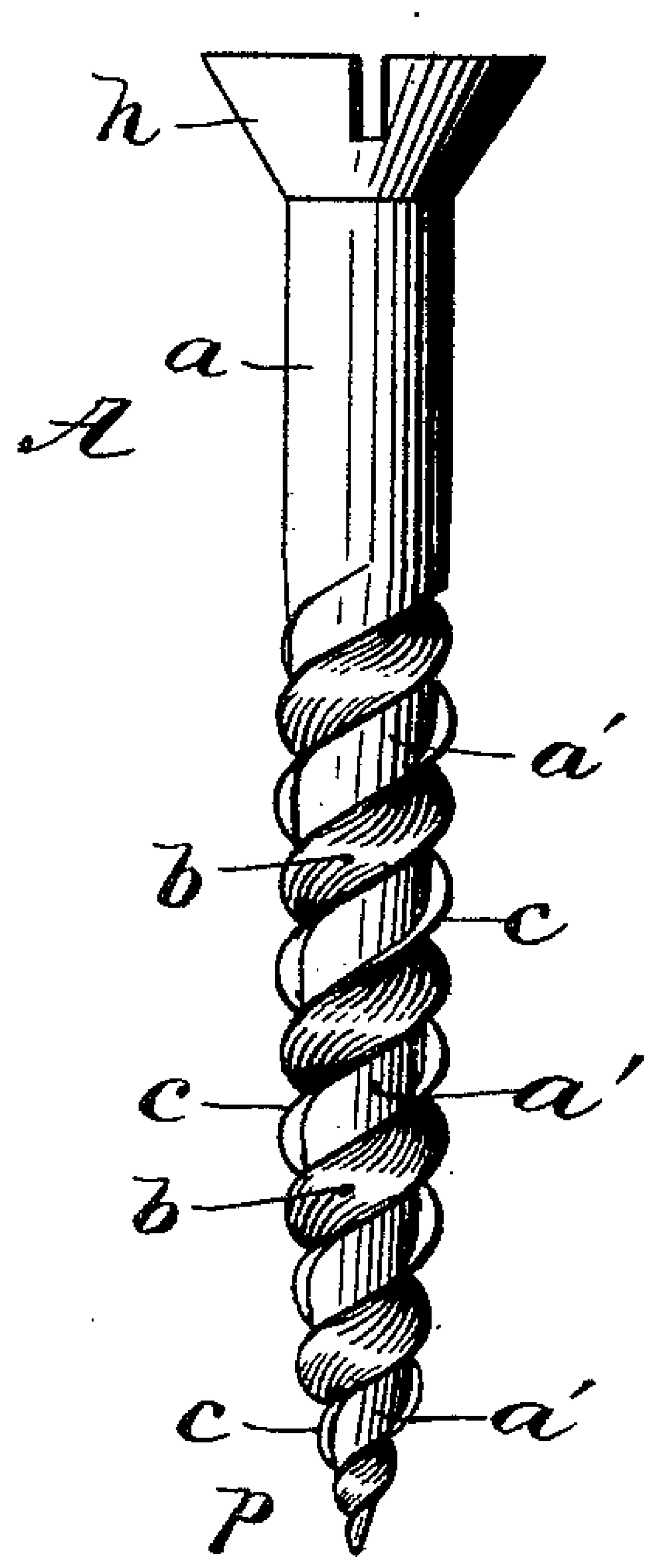

FIG. 14.

WITNESSES.

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UNITED STATES PATENT OFFICE.

CHARLES D. ROGERS, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE AMERICAN SCREW COMPANY, OF SAME PLACE.

WOOD-SCREW.

SPECIFICATION forming part of Letters Patent No. 410,697, dated September 10, 1889.

Application filed February 12, 1889. Serial No. 299,670. (Model.)

To all whom it may concern:

Be it known that I, CHARLES D. ROGERS, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Wood-Screws; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

The invention herein described is that of a wood-screw adapted to be rapidly inserted into wood without disintegrating its fibers, either by turning it in the ordinary manner, according to the pitch of its spiral threads, or by driving it as a nail is driven, the screw having great strength and capacity to hold firmly, and which can be cheaply made by rolling and without waste of material. These qualities are secured by the peculiar form of the surface which comes from the groove and thread which I form, and from the normal surface of the blank which I retain between the threads. In the ordinary wood-screw the pitch of the threads or the angle formed by the thread with a line touching it at any point and parallel with the axis of the screw is nearly a right angle. Such a screw, when inserted into wood in the ordinary manner by turning, holds against longitudinal strain mainly by the engagement of its threads with the wood. A smooth nail, on the contrary, holds by the adhesion of the wood to its surface, and it is well known that if the integrity of the wood is not impaired by the entrance of the nail the hold is very firm. If a screw with such a pitch of the thread is driven into wood by the blows of a hammer, like an ordinary nail, it will advance into the wood like a nail and form a hole equal in diameter to the diameter of the screw across the threads, and there will be no engagement of the wood with the threads of the screw, except perhaps to a slight degree, due to the elasticity of the wood. On the other hand, the wood is liable to be very much ruptured. If the pitch is increased—that is, if the acute angle it forms with a line touching it and parallel with the axis of the screw be diminished—the difficulty of inserting it into wood in the ordinary manner by turning will be increased by reason of the tendency of the threads to shear the wood, and if the pitch be greatly increased the insertion of the screw in that way becomes impossible. On the other hand, the advance of the screw into the wood with a given turning of the screw will increase. To secure, therefore, a quick advance of the screw into the wood, its threads should have a steep pitch, and if the pitch becomes too great for insertion by turning the screw may be driven into the wood like a nail, but turning on its axis as it advances. There is, however, a tendency of a screw thus driven to shear the wood, and this, together with the adhesion of the wood to the metal, often causes the disintegration of the fibers of the wood and diminishes its power to hold the screw, especially if the pitch of the screw is such that after being driven into the wood it may be withdrawn by turning in the ordinary manner. It is of especial importance with screws of steep pitch that the integrity of the wood shall be preserved, for as the pitch increases the holding power of the wood, due to its direct engagement with the metal, diminishes, and its dependence upon the adhesion to the metal increases. If the fibers of the wood are broken up in the insertion of a screw, either by turning or driving, its capacity for holding the screw is correspondingly diminished. The tendency of a screw inserted by turning to break up the fibers of the wood increases as the pitch increases, while its tendency to do this when driven diminishes.

It is often desirable that a screw which is inserted by driving should be withdrawn by turning with a screw-driver or wrench, and therefore it must contain the antagonistic conditions above referred to. These conditions are most nearly balanced when the pitch of the grooves and threads is nearly at an angle of forty-five degrees with the axis of the screw. The pitch cannot, I believe, be greatly varied from this without destroying the capacity of a screw for being driven or for being withdrawn by turning, and whatever the pitch may be and however the screw may be inserted, it is of the greatest importance that the integrity of the wood shall not be impaired. I have devised a form of thread and groove which, in connection with a part of the surface of the blank left in its normal condition, secures all these conditions and gives a screw which, according to the pitch of its threads, may be rapidly inserted and withdrawn by turning like an ordinary screw, or it may be inserted by driving and withdrawn by turning, while in either case the holding capacity of the wood is preserved. I believe all this has never been done with such practical success before as to secure any considerable use of such screws.

The surface of my screws presents three features which are not, I believe, to be found together in any screw heretofore made: first, a shallow groove impressed into the metal of a blank and having transversely a curved form; second, threads at the edges of the groove, raised slightly above the normal surface of the blank by the compression and displacement of the metal to form the groove, and, third, a portion of the normal surface of the blank between the threads having the same spiral inclination or pitch as the threads and groove.

In the accompanying four sheets of drawings I have represented my improved wood-screw in several different forms.

Figure 1, Sheet 1, is a side elevation or perspective view of a single-groove screw, the thread extending to the point. Fig. 2 is a sectional view taken through the longitudinal axis. Fig. 3 is a transverse sectional view taken on line *m m* of Fig. 2 through the plain portion of the shank. Fig. 4 is a similar view taken through the threaded portion on line *k k* of Fig. 2. Figs. 5, 6, and 7 represent modified forms of the screw-head. Fig. 8, Sheet 2, is a perspective view of the improved screw having two grooves and unthreaded point. Fig. 9 is a longitudinal sectional view taken through the center of the screw. Fig. 10 is a cross-sectional view taken through the screw on line *o o* of Fig. 9. Fig. 11 is a similar view taken on line *x x* of Fig. 9. Fig. 12, Sheet 3, is a perspective view of my improved screw having a head adapted to receive a wrench. Fig. 13 is a similar view of the screw having the unthreaded portion of the shank, or stem cone-shaped; and Fig. 14, Sheet 4, represents a perspective view of my wood-screw having a tapering or cone-shaped threaded portion.

In the drawings, A indicates my improved screw complete, having a head *h* of any well-known form. The shank *a* immediately adjacent to the head is plain or unthreaded; or it may be conical, as shown in Fig. 13.

The threaded portion of the screw is provided with one or more shallow spiral concave grooves *b*, extending below the normal surface of the blank. The two edges of the grooves extend beyond the normal surface of the blank, thereby forming threads *c*, which continue to the point *p*, as shown in Sheets 1, 3, and 4 of the drawings; or the threads may terminate at the base of the point *p'*, as shown in Figs. 8 and 9. Intermediate of the grooves and adjacent threads is the spiral surface *a'*, which is a part of the normal surface of the blank. The grooves *b* and threads *c*, like those I have described, may be formed by cutting away the metal of the blank; but I design to make them by rolling the blanks between dies in a similar manner to that described in a patent granted me September 20, 1887, No. 37C,354, but having faces fitted especially to produce the screws herein described, and which are the subject of an application filed herewith for a separate patent. Although the thread *c* of the screw rises but slightly above the normal surface of the blank, yet it is very efficient in advancing and withdrawing the screw, for its surface on a radial line may be at right angles or very slightly inclined to the axis of the screw, and its action as an inclined plane is exerted to the best advantage to move the screw along its axis. The groove, which is efficient in connection with the thread, is insufficient alone.

The spiral thread at the edges of the groove performs an important service in enabling the wood to fill the groove without rupture or disintegration. The wood which enters the groove is not so much compressed as that in contact with the spiral normal surface *a'* of the blank, and the action of the raised thread in making a defined line of separation between the portions of the wood subjected to different degrees of compression appears to relieve the wood in the groove from strain due to the greater compression of the adjacent portion, and allows it to take the form of the groove more easily and perfectly and without rupture of its fibers. If the thread is omitted or removed, the liability of the fibers of the wood to be ruptured as the screw is inserted is much increased.

The transverse curvature of the groove (see Figs. 4 and 11) is important in raising the thread by rolling, as it facilitates the lateral flow of the metal under the die. It also diminishes the tendency of the blows by which the screw is driven into the wood to break up the fibers of the wood, and facilitates the compression of the wood, so as to fill the groove completely. The cutting-edge *c* of the thread also facilitates the entrance of the screw without breaking up the fibers of the wood.

I claim—

A screw provided with one or more spiral grooves impressed into the metal of a screw-blank and with spiral threads raised between the grooves and the adjacent normal surface of the blank by the compression and displacement of the metal in forming the grooves.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES D. ROGERS.

Witnesses:
CHARLES HANNIGAN,
GEO. H. REMINGTON.