

(No Model.)

W. D. EWART.
ART OF TESTING CHAINS.

No. 372,609.

Patented Nov. 1, 1887.

Fig. 1.

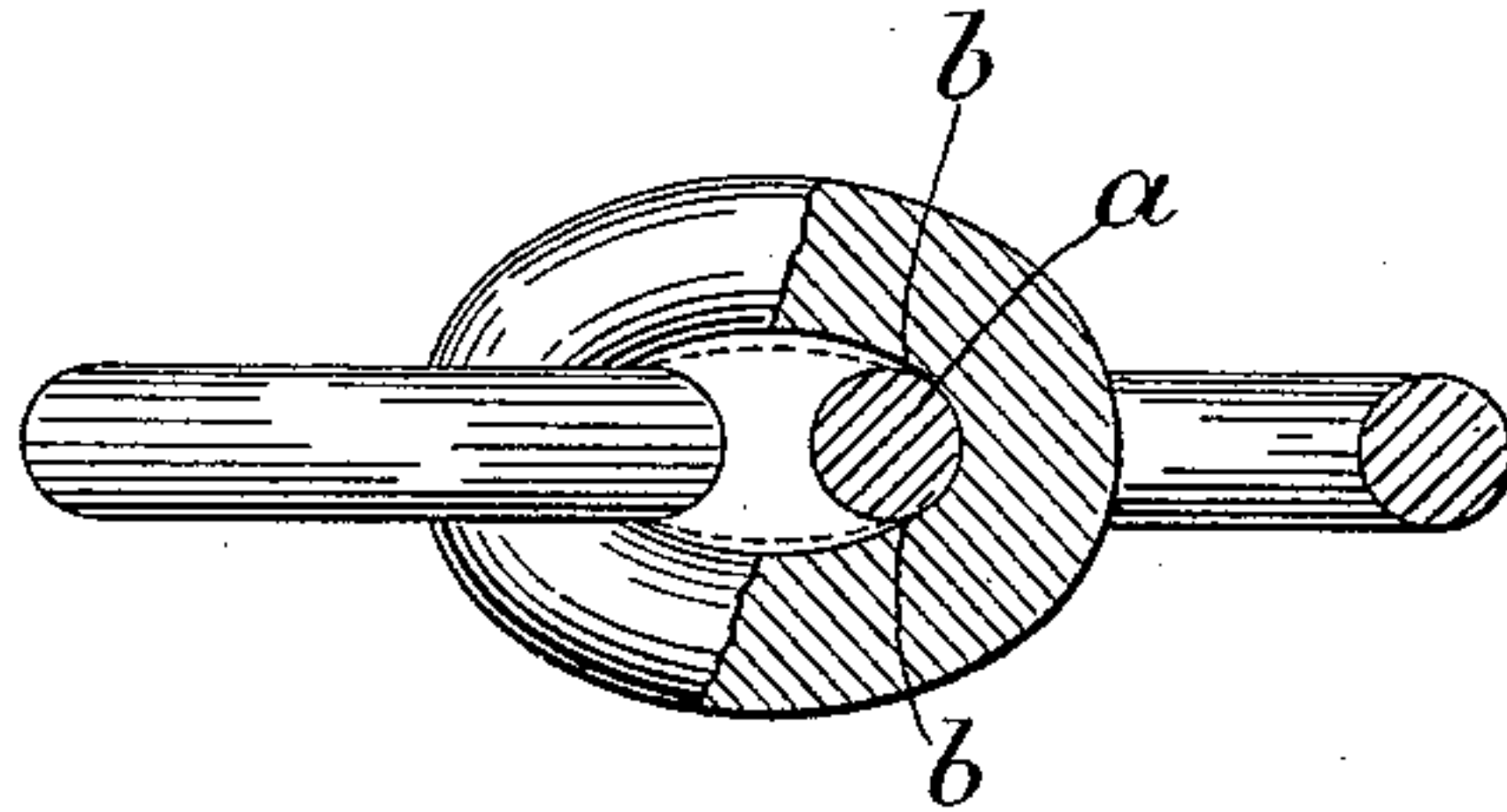


Fig. 2.

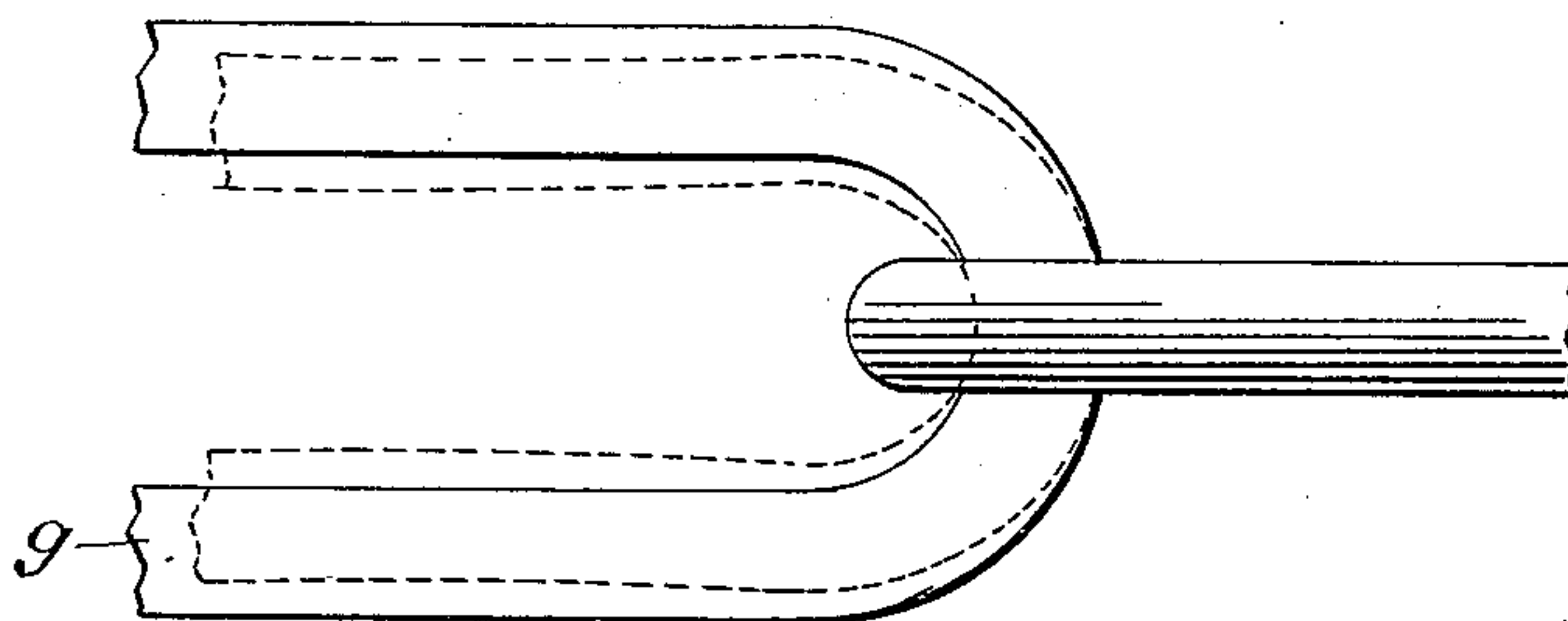
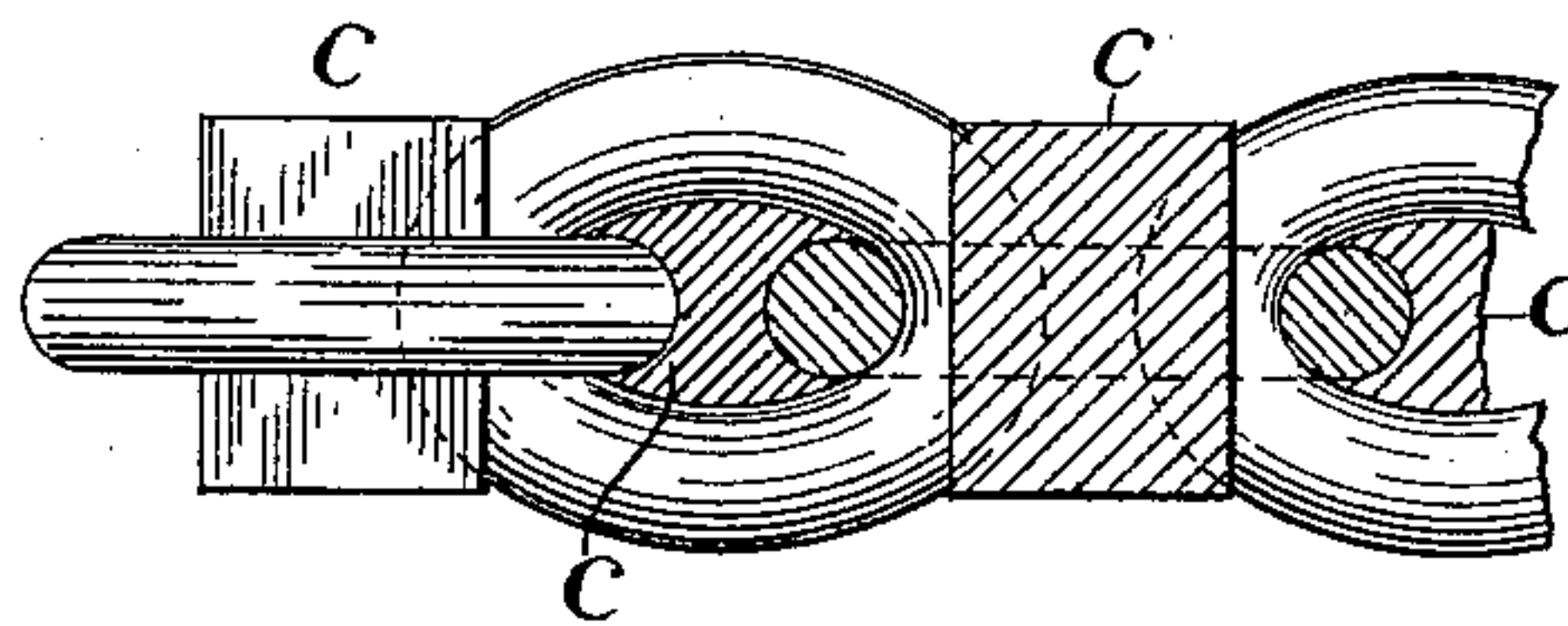


Fig. 3.

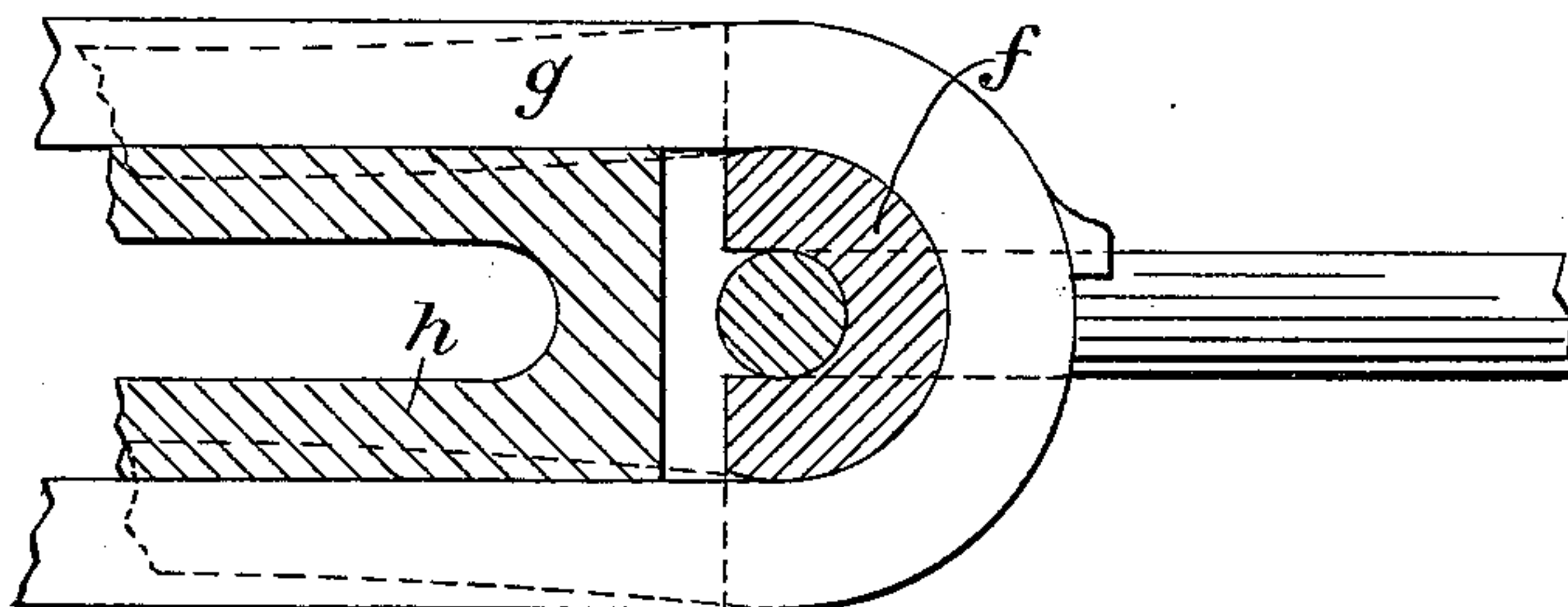


Fig. 5.

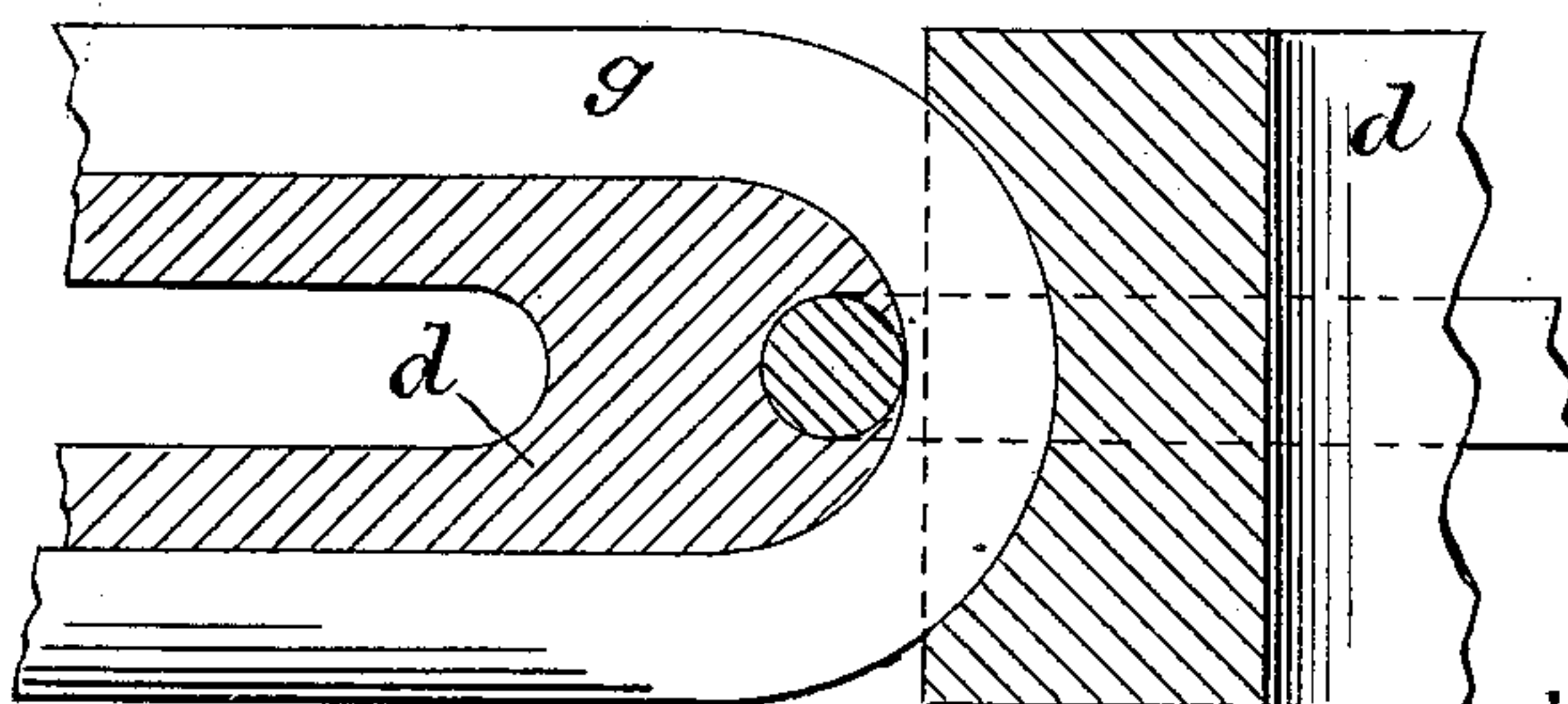


Fig. 4 -

AT TEST:

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ART OF TESTING CHAINS.

SPECIFICATION forming part of Letters Patent No. 372,609, dated November 1, 1887.

Application filed April 27, 1887. Serial No. 236,321. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM D. EWART, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Testing the Strength of Chains; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this application.

My invention relates to the art of testing chain cables, or that species of chain composed of a series of centrally-open links, (usually of similar size and contour throughout the length of the chain,) which are enchained or intertwined with each other in such manner that the links lie alternately in substantially transverse planes when the chain is pulled taut or is placed under strain in the direction of its length. In the art or methods of testing such chain, as practiced prior to my invention, it has been impracticable to test the manufactured article to an extent greater than about one-third of its intended or designed strength, (for reasons which I will presently explain,) and this inability, according to the known modes of testing to subject the finished chain to a draft-strain much, if any, greater than one-third of the contemplated breaking-strain of the chain, has led inevitably, as the experienced chain-maker well understands, to very unsatisfactory results, in that the chain furnished to the market under the best possible tests as to its standard of breaking-strain is liable, with ever so much care and attention on the part of the manufacturer, to break at a strain far below the standard or guaranteed draft-strength of the chain, by reason of the presence in a given length of the chain of a single weak link possessing some imperfection of weld or metal liable to escape the knowledge of the best workmen during the making of the chain, such weak or imperfect link having, however, been sufficiently strong to have barely withstood the testing-strain, which, as before said, is always only about one-third of that which the finished chain is supposed to be capable of bearing.

The reason why the chain cannot, according to the modes heretofore known and practiced in the art of chain-testing, be subjected to

more than about one-third of the intended breaking-strain is that if the links be subjected to any greater draft-strain they are liable to be more or less distorted from the shape in which they were finished and in which they were designed to remain in working order, and to have their shape so varied as to more or less injuriously affect the articulate joints of the chain, and hence its desired degree of flexibility.

As is well understood by chain-makers, if a chain of that form in which the links are elliptical and have their central openings rather small in comparison with the thickness of the stock of metal composing the link be subjected in the testing operation to a tensile strain of over about one-third of the intended breaking-strain, the testing-pull on the chain will operate to change the contour of each or many of the links in such a manner and to such an extent (the tendency of each link under severe strain always being to straighten out, so to speak, at the side portions of the links) as will result in destroying to a greater or less extent the intended perfect freedom of movement of the joints of the chain. It is also well understood by those skilled in the art to which my invention relates that in the case of that species of cable-chain in which, for the purposes of engagement with the sprockets or teeth of chain-wheels, the central openings of the directly-coupled links are quite large in proportion to the thickness of bar or stock composing the link, any subjection of the chain to a testing-strain of a third or less equal to the designed breaking-strain results in a distortion of the links sufficient to seriously impair its perfection of action in practical use.

There is a comparatively modern form of or a modification of the last-mentioned species of cable-chain (having links adapted to run on sprocket-wheels) in which, by the presence of bearer-blocks arranged intermediately of the adjacent ends of the coupled links, the links are rendered somewhat better capable of withstanding the testing-strain; but even in this form of chain not more than one-third of the intended breaking-strain of the finished chain can be applied to the latter during the testing

operation without distorting the straight side bars of the links into curved lines, so as to effect more or less cramping of the parts of the chain at the localities of the chain-joints, and thus impair the intended and desirable freedom of movement of the parts, rendering the chain, after testing, defective as to its flexibility.

I propose by my invention to provide, for use in the art of testing chains of the type alluded to, a mode or method of and suitable means for subjecting the completed chain to a draft-strain almost as great as that predetermined as the actual breaking-strain of the finished article of manufacture (or, in other words, nearly as great as the maximum strength proposed for the chain) without any liability of impairing the original forms or the structural qualities of the links, so as to injuriously affect in the least the perfection of action of the joints of the chain.

To this main end and object my invention may be said to consist, essentially, in supporting or sustaining the links during the testing operation in their original conditions and against the disturbing tendency of a severe test-strain by the use of any suitable temporary stays or supporting devices arranged within the central openings of the links, whereby I am enabled to subject the chain to a pulling-strain nearly or quite equal to that established in each case as representing the maximum strength of the chain, and to thus break out (and replace) before putting the chain on the market, or into commercial use, any flawed link or imperfect weld.

To enable those skilled in the art to which my invention relates to understand and practice the same, I will now proceed to more fully explain my improvement, referring by letter to the accompanying drawings, which form part of this specification, and in which I have illustrated the operations and effects of the heretofore-practiced modes of treatment of the chain, and have also shown how I propose to test the chain to nearly or quite its maximum strength without any risk of injury to its working parts.

Figure 1 is a sectional elevation of a piece of ordinary chain cable, showing by dotted lines the distorting effect of the testing draft-strain. Fig. 2 is a view similar to Fig. 1, but showing, in connection with the chain, the temporary stay-pieces. Fig. 3 is a side view of a cable-chain of the form usually used on sprocket-wheels, and illustrating by dotted lines the effect thereon of the testing draft-strain. Fig. 4 is a similar view to Fig. 3, but showing also the stays to prevent distortion. Fig. 5 is a view showing an improved form of cable sprocket-wheel chain, in which bearer-blocks are arranged intermediately of the adjacent ends of the links, and in which are the inserted temporary stays.

In the drawings I have shown at Fig. 1, partially in section and partially in elevation, a

piece of cable-chain (about full size) of an approved pattern, and by dotted lines on the middle link of the chain I have illustrated or indicated the change of form or the distortion of the contour of the links that arises whenever such chain may be subjected to a draft-strain much more than one-third of that which is designed to represent the maximum tensile strength of the chain. By reference to this figure it will be seen that whenever, by subjecting such a chain as shown to a pulling-strain (by any of the well-known means employed for testing or proving chains) sufficient to distort the contours of the links by partially straightening out the longer sides or portions of the ellipses, as indicated by the dotted lines, the effect will be to slightly pinch or grip the end portion, *a*, of one link between the drawn-together side bars or portions, *b b*, of the link with which the portion *a* is interlinked, and that this effect operates to impair the original (and desirable) degree of freedom of movement of this part *a* of one link within or between the embracing portions *b b* of the other link, to the great injury of the structure in a practical point of view; and it will be understood that in practice the subjection of such a chain as shown to a testing-strain of a little over one-third the calculated maximum strength of the chain will suffice to bring about the injury to the chain just above explained.

Now, under my new mode of treatment of such a chain in performing the testing operation, I first drive into all the interstices of the chain, or into those portions of the central openings of the links that are not preoccupied by parts of other links, metallic keys or stay-blocks, such as seen at *c* of Fig. 2, (in which figure I have shown, in partial elevation and partial section, the same sort of chain shown at Fig. 1,) and having thus inserted the stays *c*, I then subject the length or piece of chain to be tested to the action of any of the known appliances used for chain-testing, and then submit the chain to a pulling-strain nearly equal to that designed or calculated to represent the maximum tensile strength or breaking-strain of the finished article. It will be understood that by thus filling in or keying up the links, so to speak, I am enabled to pull on the length of chain nearly up to the calculated breaking-strain without in the least distorting the links as to their contour, and hence without in any manner impairing the joints or articulations, on the perfect action of which depends the requisite flexibility of the chain.

Of course a set of keys such as seen at *c* are provided, sufficient in number to stay simultaneously all the links of the given length of chain to be treated at one operation of the testing-machine, the same set being reused in testing another similar length of chain.

At Fig. 3 I have shown, in side view, a piece of that species of cable-chain which is adapted to be used on sprocket-wheels, and which therefore is composed of links each of

which has a comparatively large central opening, and by dotted lines in said figure I have indicated the distorting effect on the contour of the link that results from any attempt to severely test the strength of such a chain, which effect, it will be seen, is such as to render the chain incapable of perfectly fitting to and working in engagement with the teeth of the sprocket-wheel with which it may have been designed to use it. In testing this form of chain I insert keys or stays, such as seen at *d*, Fig. 4, which, in cases where the links are very large, may be made hollow as shown at said figure. By first thus filling in or blocking up the central openings of all the links of a piece or length of chain to be tested I am enabled to test the strength of such piece of chain to any desired extent within the calculated breaking-strain of the links.

At Fig. 5 I have shown an improved form of cable-chain for sprocket-wheels, in which the links are coupled indirectly through the media of intermediately-arranged bearer-blocks *f*. In this form of chain, though the links are supported against a distortion of their semicircular ends by the presence of the blocks *f*, any testing-pull on the chain to the extent of fully one-third its calculated maximum strength (or sometimes even less) will operate to distort the side bars, *g*, of the links in the manner indicated at Fig. 4, and cause the bearing and working surfaces of the articulate portions of the links to bind on the saddle-like bearing-grooves of the blocks *f* in a manner and to an extent such as to seriously impair (by the testing operation) the perfect operation, and hence the practical success of the finished and tested article of manufacture. In testing this special form of chain I employ keys or stay-blocks, such as seen at *h*, which may be hollow, (and at the same time be strong enough,) where the chain is composed of links having very large central openings.

From what I have herein explained, and

from the accompanying illustrations, it will be understood that by my novel mode of procedure in testing chains, or, in other words, by my improvement in the art, I am enabled, without in any way materially or injuriously changing the conditions of the parts of the chain, or the joints between said parts, to break out any weak member incapable of bearing a strain almost equal to that which the strongest member will actually sustain; and thus by my invention is accomplished the great desideratum of a test which actually demonstrates the strength of every part of the chain to be actually up to the calculated breaking strain or standard of maximum strength. This is something which, so far as my knowledge of the art extends, has never before been accomplished; and my invention or improvement is therefore broad in its nature and not restricted to any particular form or forms of either the chain to be tested or the appliances employed in carrying into effect my improvement, so long as the means used be adapted to effect the proper maintenance of the links of the various forms of chain in their original shapes during the subjection of the chain to the testing operation.

What I claim is—

An improvement in the art of testing chains, which consists in supporting or maintaining the stock comprising each link in its original and proper form by the introduction into the interstices of the chain of suitable temporary stay-blocks, or equivalent devices, during the subjection of the chain to the testing operation or strain, substantially as and for the purpose set forth.

In witness whereof I have hereunto set my hand this 22d day of April, 1887.

WILLIAM D. EWART.

In presence of—

GEO. LAWRENCE, Jr.,
J. G. MARSH.