

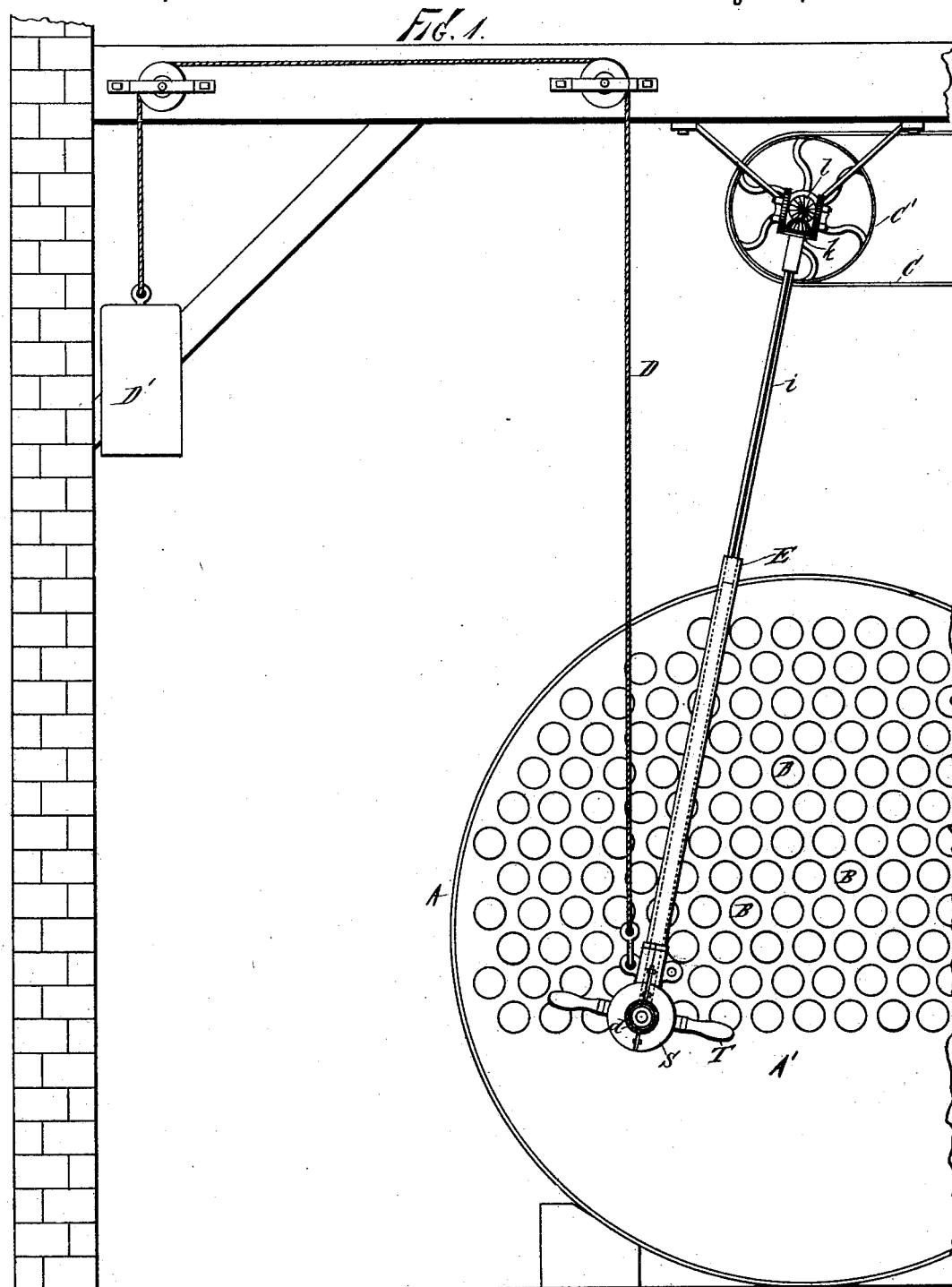
(No Model.)

3 Sheets—Sheet 1.

J. HARTLEY.  
TUBE EXPANDER.

No. 342,356.

Patented May 25, 1886.



Witnesses:  
John Buckler  
L. H. Osgood.

James Hartley  
Inventor.  
By Norton Osgood  
Attorney.

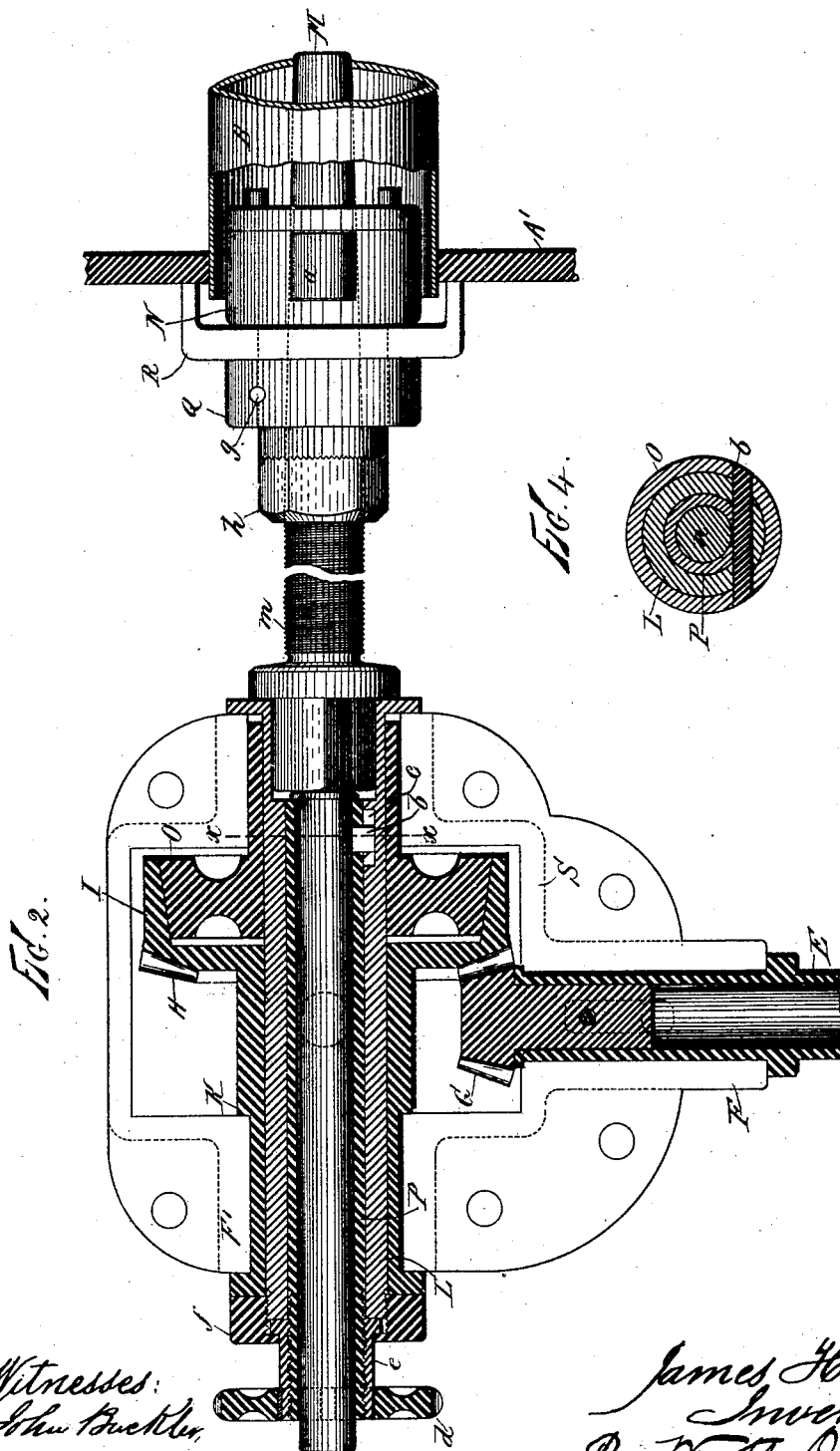
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Witnesses:  
John Buckler,  
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James Hartley,  
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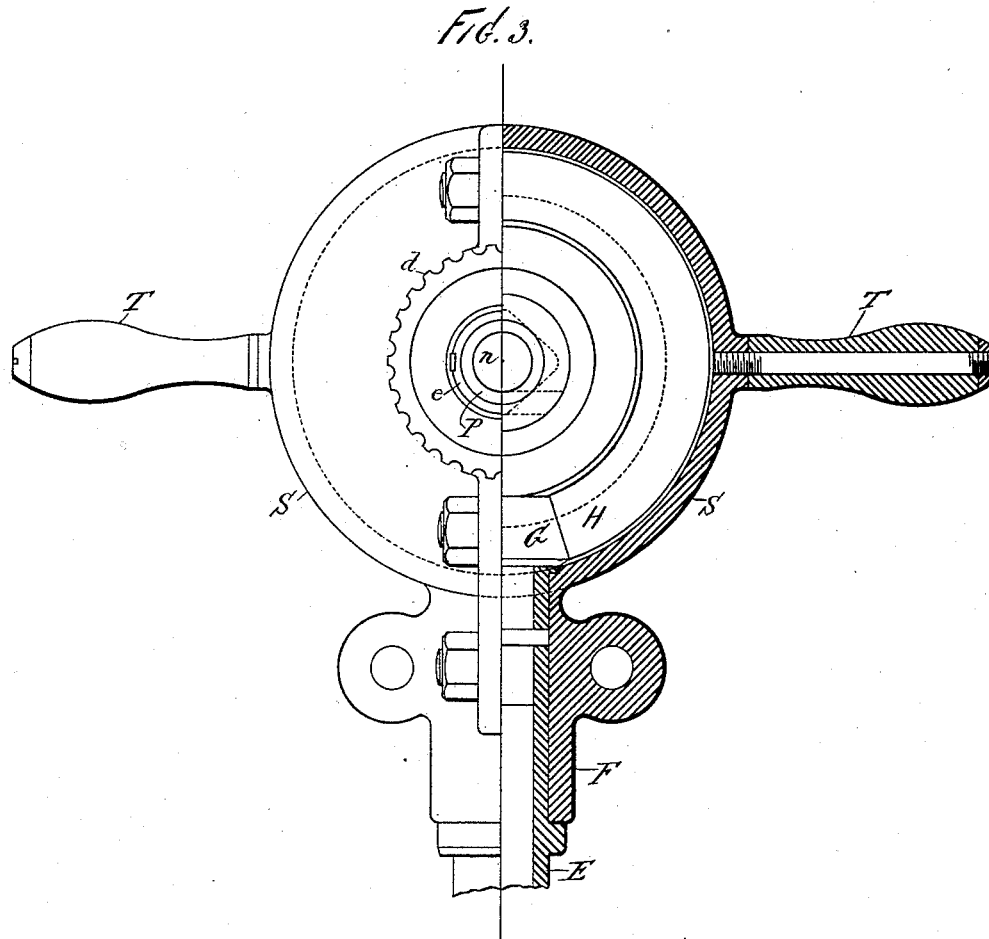
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TUBE EXPANDER.

No. 342,356.

Patented May 25, 1886.



*Witnesses*  
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*L. H. Osgood*

*James Hartley,*  
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*Attorney.*

# UNITED STATES PATENT OFFICE.

JAMES HARTLEY, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE PIONEER  
IRON WORKS, OF SAME PLACE.

## TUBE-EXPANDER.

SPECIFICATION forming part of Letters Patent No. 342,356, dated May 25, 1886.

Application filed April 8, 1886. Serial No. 198,300. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES HARTLEY, of Brooklyn, county of Kings, and State of New York, have invented certain new and useful  
5 Improvements in Power Tube-Expanders, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

10 My invention has relation to that class of devices employed for expanding the tubes of boilers into their seats in the boiler-heads or other parts for the purpose of making the joints tight as is required. These devices are  
15 ordinarily known as "tube-expanders."

The object of my invention is to produce a simple, compact, durable, and effective tube-expander to be operated by power which may be easily shifted from one tube of the boiler to another, easily thrown in or out of gear, readily  
20 adjusted to working position, perform its work as rapidly and thoroughly in one position as in another, be easily, quickly, and powerfully withdrawn from any tube after  
25 performing its work, and in which the hands of the operator are shielded against accidental contact with the working parts, and various parts protected against dust or dirt, &c. To accomplish all of this and to secure other advantages, as will hereinafter appear, my  
30 improvements involve certain new and useful peculiarities of construction, relative arrangements or combinations of parts, and principles of operation, as will be herein first fully described, and then pointed out in the claims.

35 In the accompanying drawings, forming part of this specification, Figure 1 is a view in elevation, showing my improved tube-expander in position for use in connection with a tubular boiler, and indicating a preferred  
40 means of coupling it with the driving-power. Fig. 2 is a longitudinal section and partial elevation of the expander in position for work, showing the construction and arrangement of  
45 its various parts. Fig. 3 is an end elevation and cross-section upon a plane passing through the axis of the driving-shaft. Fig. 4 is a cross-section through line *xx* of Fig. 2, showing the pin or key which connects the longitudinally-

adjustable interior sleeve with the friction- 50  
cone sleeve.

In all these figures like letters of reference wherever they occur indicate corresponding parts.

A represents any boiler having any number 55  
of tubes, as B B, to be expanded.

C is a belt, and C' a belt-wheel, to be driven from any source and serving to represent any means by which power is communicated to the expander. 60

D is an ordinary rope or cable, and D' a weight applied thereto, and intended to represent a convenient form of counter-balance for use in connection with the expander, so that it may be shifted about with ease to bring 65  
it to the desired working point opposite any tube.

E is a shaft, to which the driving-power is transmitted, the same being intended, if desired, to be kept continuously in motion while 70  
the expander is being used. This shaft is journaled within the neck F of the casing of the implement, and carries with it a beveled wheel, G, which meshes with a corresponding wheel, H, the latter carrying upon one side a 75  
hollow friction cone or drum, I, and upon the other a sleeve, K, which revolves in the bearing provided for it in the neck F' of the casing.

L is a sleeve having an angular hollow head 80  
calculated to receive and hold the head of pin M of the expander, of which pin the portion passing through box N is made tapering and arranged to carry the short cylindrical roller, as *a*, around and in contact with the inner 85  
surface of the end of the boiler-tube as the pin and box revolve. The rollers, as *a*, (of which three are usually employed,) effect the necessary expansion of the tube to make it fit its seat in a manner which is now well understood. 90

O is a friction-cone, made to fit the inner conical surface of drum I. It is loosely mounted upon the sleeve L, so that it may be adjusted back and forth thereon, and is keyed 95  
or pinned, as by key or pin *b*, to an inner hollow sleeve, P; the pin passing through a slot, *c*, cut for it in the wall of L. When the

cone O is moved along and out of contact with I, the wheel H revolves without carrying the inner sleeves with it; but as soon as O and I are brought into frictional contact one with the other the sleeve L and expanding-pin M are forcibly carried around with H and I, and the power thus transmitted to the tapering pin M.

At *d* is a hand-wheel within convenient reach of the operator, the wheel being keyed upon an interiorly-threaded collar or nut, *e*, the inner end of which is flanged and held in place in prolongation of sleeve L by a flanged cap, as *f*, threaded upon the sleeve, the arrangement being such as to permit the nut *e* to revolve, but to prevent any longitudinal movement thereof. The threaded interior surface of nut *e* engages with the correspondingly-threaded end of the longitudinally-adjustable sleeve P, so that by turning the hand-wheel *d* in either direction the sleeve P is caused to advance or recede, and this furnishes a means of easily and powerfully forcing the friction-cone O in or out of working contact with drum I, or to clutch or unclutch the expanding-pin M through intervening parts with the driving-shaft E, as will be readily understood.

The box N revolves with a collar, Q, and has a yoke or bridge, R, for bearing against the head A' of boiler A, or against the plate in which the ends of the tubes are to be expanded. A key, *g*, prevents the box N and collar Q from becoming separated. A portion of the expanding-pin M is screw-threaded, as at *m*, and has mounted upon it a free moving nut, *h*, the face of which is roughened, substantially as indicated, and calculated to bear (when required) against the end of box N, which end may be correspondingly roughened.

S S are the sections of the casing made to surround the friction-drum and adjacent parts, the sections being bolted together and operating to exclude dust and dirt from the interior and to protect the hands of the operator from accidental contact with the working parts.

T T are handles secured upon the casing and affording means for shifting the expander from one tube to another.

These parts being arranged substantially as above set forth, the expander is shifted so as to carry the box N into the end of a tube until the bridge R brings up against the head A', thus determining the proper location of the box and its cylindrical rollers. The hand-wheel *d* is then turned so as to force the cone O into contact with I, thus causing expanding-pin M to revolve, and the pin is crowded in by pressing upon the handles T until it forces the rollers *a* against the inner surface of the tube. As soon as the rollers bite upon the tube the box N revolves with pin M, and the necessary expanding is effected. During this operation the nut *h* is not allowed to come in contact with the end of box N. As soon as

the expanding is accomplished, the operator turns the nut *h*, so that it will bear against the end of N, and then as the pin M continues to revolve, the nut being prevented from advancing, it (the pin) is forced backward until its tapering part releases the rollers *a*, when the expander-head may be easily withdrawn from the tube and carried into another tube. If the pin M turns to the left, the thread *m* turns to the right.

The forcible retraction of the expander-pin is a valuable feature. Without provision for it the head has at times to be withdrawn by hand, for it frequently becomes set or jammed in tightly. The means proposed for accomplishing this part of the invention are very simple and efficient. They add practically nothing to the weight of the implement and very little, if anything, to its cost.

The pin *g* is removable, and the collar Q and yoke R may be set at any desired point on the projecting part of box N.

For driving the expander thus above described of course any suitable means may be provided for connecting its driving-shaft with the device from which power is to be transmitted—as, for instance, flexible or knuckle joint connections. I prefer the device shown in Fig. 1 for this purpose. The shaft E is made hollow and receives a shaft, *i*, upon which it may be adjusted up or down, the two shafts being connected in such manner that they must revolve together, no matter at what relative positions adjusted. The shaft *i* carries a hemispherical gear, *k*, which meshes into or with another of like character, as at *l*, the latter being the driving-gear. The shaft *i* is suspended in such manner, substantially as indicated, so that it may swing from side to side or back and forth, always keeping *k* in gear with *l*. This is a light, substantial, and durable means for driving the expander, admitting of all the necessary adjustments and running in all positions with equal ease and certainty. Within the inner sleeve, P, is a loose pin, *n*, projecting through the hand-wheel *d* at one end and bearing against the inner end of the angular head of expander-pin M at the other end.

In starting the expander to work it is frequently difficult to press upon it hard enough to make the rollers *a* bite properly. I therefore employ the pin *n*, which, being struck or tapped with a copper hammer or other implement, starts the pin M forward with all the power that is required to make it force rollers *a* out to a biting position. The pin *n* is prevented from being accidentally displaced by an enlarged head, which bears against the end of the adjusting-sleeve.

Any suitable metal may of course be employed in the construction of the improved expander. I have found it advantageous to use steel in most of the working parts, because of its lightness and superior strength.

The device when constructed substantially

in accordance with the foregoing explanations has been found in practice to admirably answer the purpose or object of the invention, as previously set forth.

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

1. In combination with the driving-shaft of a tube-expander, the swinging shaft and the  
15 hemispherical gears, mounted and arranged substantially as shown and described.

2. In a tube-expander, the friction-drum driven by the driving-shaft, the friction-cone, and the adjusting-sleeve, said cone and sleeve  
15 being connected one with the other and the sleeve provided with means for forcing it to move in either direction, substantially as shown and described.

3. In a tube-expander having a friction-drum and friction-cone, the combination, with  
20 said drum and cone, of a sectional casing arranged to cover the parts, substantially as and for the purposes set forth.

4. In a tube-expander, the combination,  
25 with the sectional casing, of the handles applied thereon, substantially as and for the purposes set forth.

5. In a tube-expander, the adjusting-sleeve

connected with the friction-cone, said sleeve being threaded at its outer end and combined  
30 with a thimble and hand-wheel for moving the sleeve, substantially in the manner and for the purposes set forth.

6. In a tube-expander, the sleeve for carrying the expander-shaft, said sleeve being slot-  
35 ted for the passage of the pin connecting the adjusting-sleeve with the friction-cone, substantially as shown and described.

7. In a tube-expander, the combination, with the expanding-pin, of the loose driving-  
40 pin bearing against its inner end, substantially as and for the purposes set forth.

8. In a tube-expander, the expander-pin arranged to be driven by power, the same having a threaded portion and being provided  
45 with a nut arranged to bear against the end of the head or box, substantially as shown, and for the purposes set forth.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of  
50 two witnesses.

JAMES HARTLEY.

Witnesses:

JOHN BUCKLER,  
WORTH OSGOOD.