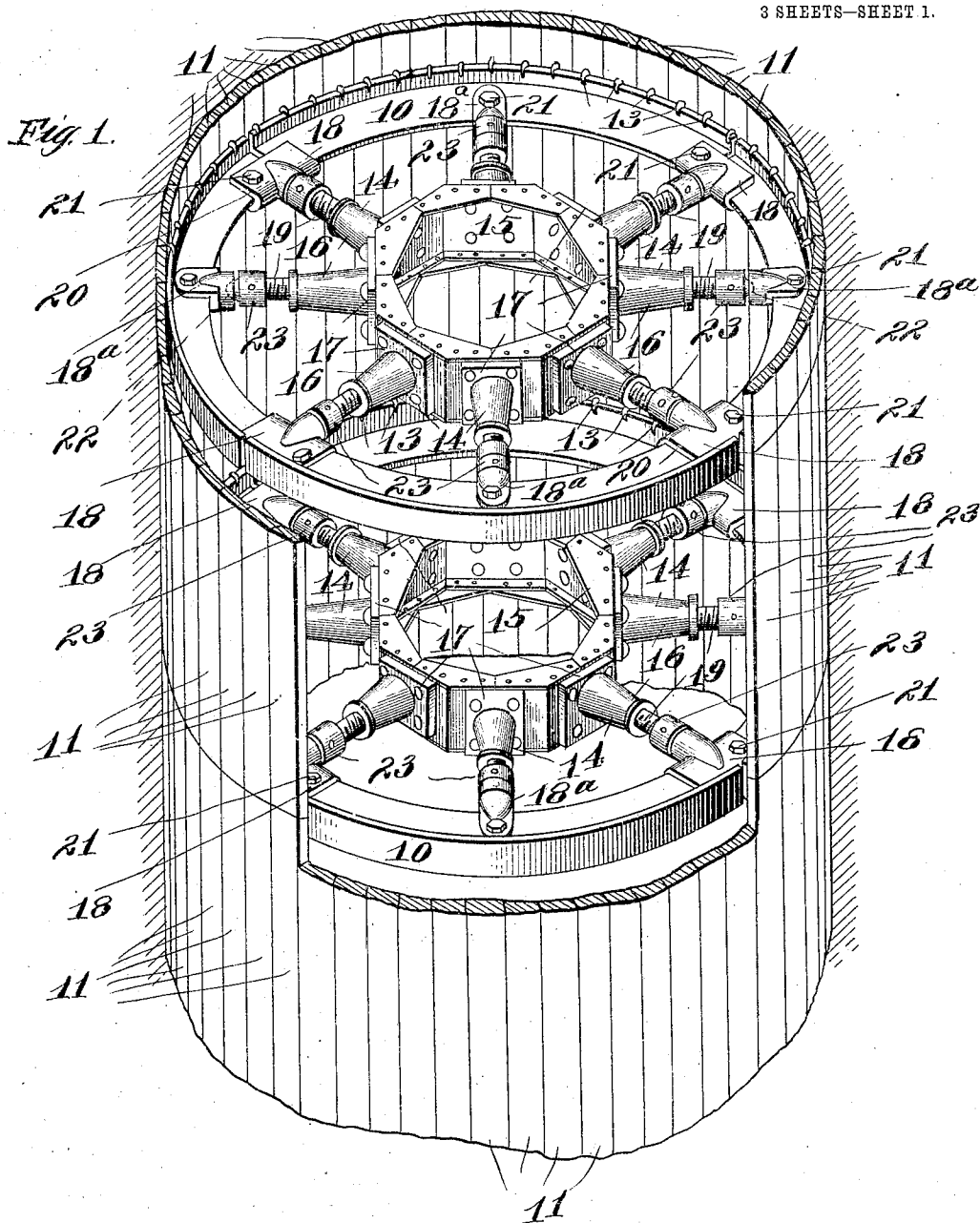


G. W. JACKSON.
ART OF CONSTRUCTING CONCRETE FOUNDATION PIERS.
APPLICATION FILED NOV. 8, 1905.

3 SHEETS—SHEET 1.



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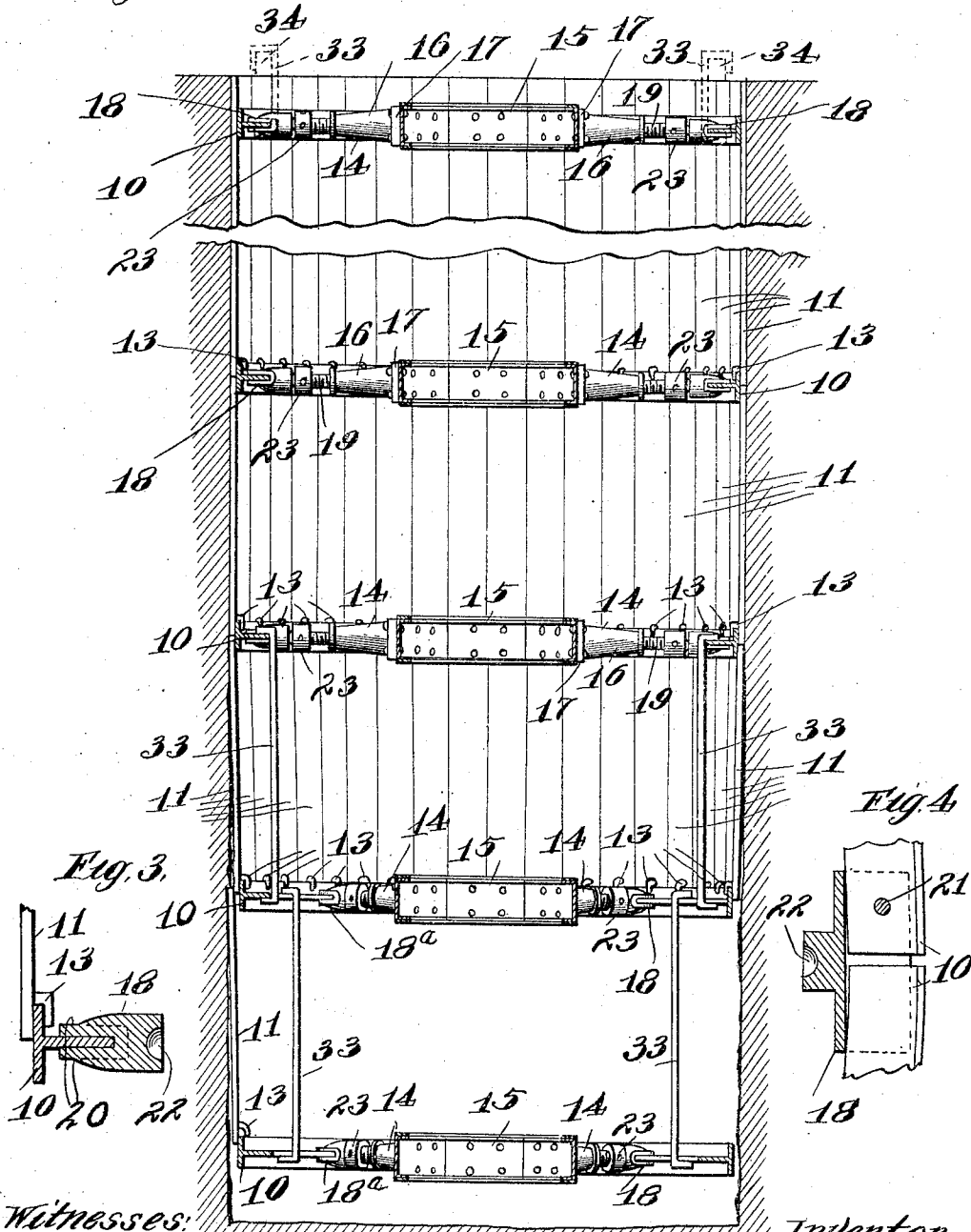
No. 846,108.

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3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 5.

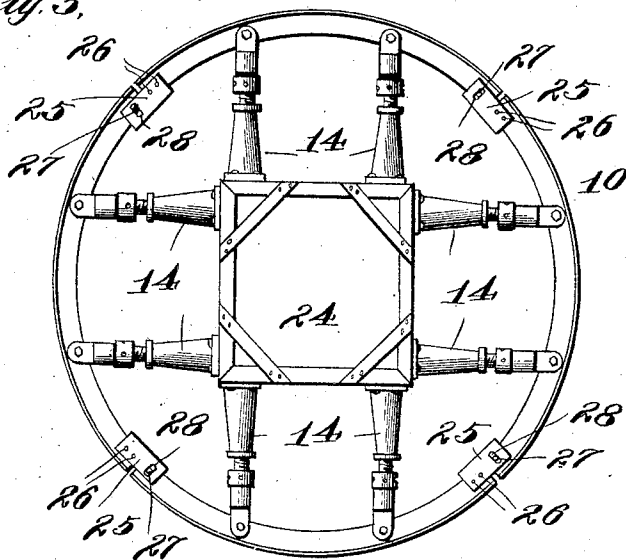
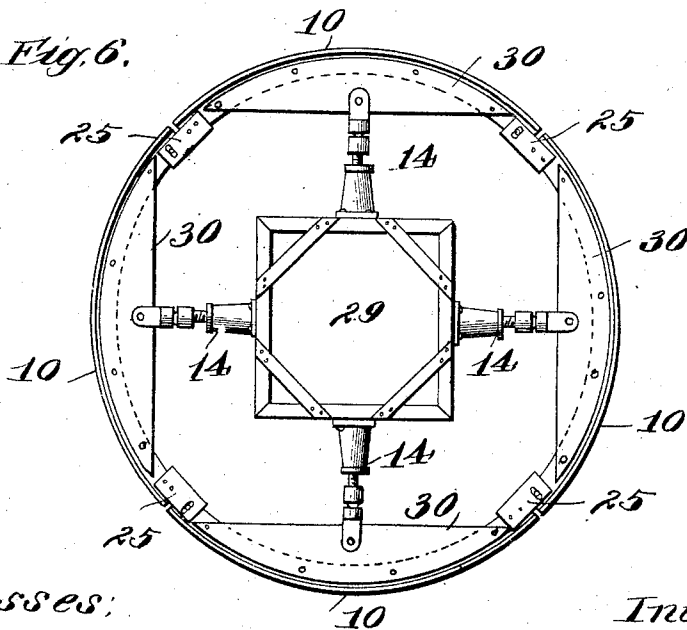


Fig. 6.



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UNITED STATES PATENT OFFICE.

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ART OF CONSTRUCTING CONCRETE FOUNDATION-PIERS.

No. 846,108.

Specification of Letters Patent.

Patented March 5, 1907.

Application filed November 8, 1905. Serial No. 286,421.

To all whom it may concern:

Be it known that I, GEORGE W. JACKSON, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in the Art of Constructing Concrete Foundation-Piers in the Earth; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to improvements in the art of constructing in the earth foundation-piers of that kind consisting of a solid column of concrete or like substance which is formed, while in a plastic state, in a well or excavation sunk in the earth and afterward hardens to constitute a solid pier that is embedded in the earth and upon which a building or other foundation is supported.

The improvements constituting my invention relate more specifically to the means of preparing the excavation for receiving the plastic material, which hardens to constitute the pier. In sinking the excavation preparatory to forming a foundation-supporting pier of this character it is the present practice to support the wall or sides of the excavation from caving inwardly as the work of excavation progresses by means of lagging of suitable length held outwardly against the sides by rigid metal rings spaced at suitable distances apart within the surrounding lagging and constructed to support the lagging, said short-length lagging constituting when the excavation is completed a sectional lining or caisson for the excavation, the sections of which are horizontally divided. The successively lower sections of the lagging are inserted in place beneath the sections already fixed in place as the removal of the earth progresses to deepen the excavation. The plastic material, which hardens to constitute the pier, is thereafter formed in the excavation thus lined, the lining remaining in place, and said lagging and supporting-rings constitute a permanent part of the pier structure.

Under the present practice considerable difficulty has been encountered in supporting the lagging already set at the time a lower section of lagging is inserted in place. Furthermore, it is not possible when sinking

excavations for this purpose to form and maintain the wall of the excavation vertical and regular, and as a result there is formed between the lagging and the sides of the excavation pockets or spaces which are separated from the excavation by the lagging, and which do not, therefore, receive the plastic concrete which is afterward placed in the prepared excavation to constitute when hardened the pier. In such instances if the excavation should happen to intersect a strata of earth which by reason of its character or by reason of weight or pressure thereon tends to shift such shifting earth will find its way to such openings around the completed pier and fill the same, and as a result the superposed strata are shifted or displaced, thus disturbing building or other foundations supported therein or thereon.

It is one of the objects of this invention to so place the lagging or sectional lining or caisson within the excavation as to avoid the presence of such pockets or spaces around the lagging and completed pier, and thereby avoid the danger attendant upon the shifting or displacement of the loose or compressed strata of earth. To this end I propose to expand the lagging outwardly against the wall of the excavation before the concrete is placed therein in such manner as to compress the earthen wall of the excavation, and thereby fill up or obliterate the objectionable pockets or spaces between the lagging and the earthen excavation-wall.

A further object of the invention is to facilitate the insertion of the successively lower sections of the lagging as the work of excavating progresses, and to thereby enable the work to be effected with greater ease and with less labor than under the present practice.

My invention embraces, in one of its aspects, an improvement in the method of constructing foundation-piers in the earth, which consists in digging the excavation, lining the wall of the excavation with successively lower sections of lagging of suitable length as the work of excavating progresses, and expanding said lagging outwardly against said wall preparatory to forming the concrete pier therein for the purpose set forth.

The invention relates, in another aspect, to apparatus for pressing outwardly or expanding the lagging against the wall of the

excavation or well after it has been placed upon the supporting-rings, located to receive the same, thereby not only effecting the obliteration of spaces or pockets in the excavation-wall behind the lagging, but also supporting the successive lengths of lagging from falling or slipping downwardly by their frictional contact with the excavation-wall.

The invention relates also to means for properly spacing the lagging-supporting rings as each ring is placed in position and for suspending the rings and lagging after the same have been placed, but before the lagging is expanded against the wall of the excavation.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a fragmentary perspective view of a section of an excavation, showing the lagging constituting the sectional lining or caisson thereof and the lagging-supporting rings and showing also the apparatus for expanding the lagging outwardly against the wall of the excavation. Fig. 2 is a vertical section of the excavation, illustrating the manner of placing in position the lagging and the lagging-supporting rings. Fig. 3 is a detail sectional view illustrating the manner of supporting the lagging on the supporting-rings. Fig. 4 is a detail view illustrating the manner of attaching the expanding devices to the expansible supporting-rings. Figs. 5 and 6 are cross-sections illustrating modifications of the invention.

As shown in said drawings, 10 10 designate the lagging-supporting rings, and 11 11 the strips of lagging supported thereon between said rings and the sides of the excavation. The said lagging is arranged in superposed sections of a suitable length, the strips of each section meeting in abutting relation, and the rings are located at such vertical distances apart that the abutting ends of the lagging-strips meet at the vertical center faces of said rings, as more clearly shown in Fig. 3. The said lagging-strips are supported on the rings by means of hooks 13 13, which hook over the upper margins of the rings, which latter, as herein shown, are made of T shape in cross-section, with the central web thereof directed inwardly. The said rings are constructed to be expanded by pressure applied from the inside thereof, whereby such pressure is transmitted to the lagging supported on the rings to force or press the same outwardly into close contact with the sides of the excavation. As herein shown, each ring is made of a plurality of curved sections, which are jointed at their meeting ends so as to be capable of expansion, for the purpose set forth. The means shown for expanding said rings outwardly consist of a plurality of screw-jacks 14, which are attached at their inner ends to and

extend radially outwardly from a central open frame or ring 15, and said screw-jacks are removably attached at their outer ends to the expansible lagging-supporting rings. Said screw-jacks 14 each comprise a sleeve 16, provided at its inner end with a flange 17, by which it is attached to one of the faces of the central ring or frame 15, and a screw 19, extending into and having screw-threaded engagement with said sleeve and connected at its outer end with the lagging-supporting ring. As herein shown, the connection between said lagging-supporting rings and the outer ends of the jacks consists of forked fittings 18 and 18^a, the arms 20 of which extend above and below the horizontal webs of the lagging-supporting rings and are attached thereto by bolts 21, and the inner ends of the shanks of which are provided with sockets 22, which receive the outer rounded ends of the screws 19. Said screws 19 are provided with fixed collars 23, having spanner-holes therein, whereby the screws may be rotated to turn the same into and out of the sleeves. The fork-arms of the fittings 18 are made wide, so as to afford a jointed connection between the adjacent ends of the curved ring members. For this purpose each fitting is attached at one side by a bolt 21 to the web at the end of one of the adjacent ring members and loosely receives the web of the end of the associated or adjacent member, Fig. 4.

The inner rings or open frames 15, to which the jack-screws are attached, are made of sufficient diameter to permit a man to pass therethrough and to permit hoisting buckets or cages to pass therethrough, thereby not interfering with the work of excavation or the lowering of material into the excavation.

The central open frames or rings (shown in Figs. 1 and 3) are made octagonal and eight screw-jacks are attached to and extend outwardly from said frame. In Fig. 5 I have shown a rectangular central frame 24, and the jack-screws 14 in this instance are attached to said frame, two at each corner thereof. In this instance each expansible ring is made of four curved members, which are joined together by means of forked fittings 25, each of which is attached to the end of one of said ring members by rivets or bolts 26 and is loosely connected with the adjacent end of the adjoining member. As herein shown, said adjoining member is provided with a pin 27, that extends through transversely-disposed slots 28 in the arms of said fittings. The jack-screws are connected at their outer ends with the ring-sections between the jointed connections thus described through the medium of forked fittings, like the narrower forked fittings 18^a of the previously-described construction. The construction shown in Fig. 6 embraces a cen-

tral rectangular open frame 29, like the frame 24, (shown in Fig. 5.) and four jack-screws 14, which are attached at their inner ends to sides of the frame and at their outer ends to plates 30, fixed to the jointed ring members in any suitable manner.

The manner of digging the excavation and the manner of placing the lagging-rings and lagging therein to support the sides of the excavation is carried on generally as follows: The excavation is dug in progressive sections of such depth that the sides thereof may be safely depended upon to support themselves without tendency to fall or cave inwardly. After each section of earth of a predetermined depth has been removed from the excavation a lagging-supporting ring, which has been lowered into the excavation in sections, is set up at the bottom of the excavation, together with the expanding-screws and inner frame, and is suspended by means of suspending-rods 33 from a superjacent lagging-supporting ring or other suitable support a distance from the lagging-supporting ring last placed in position to correspond with the length of the lagging-strips. Thereafter the lagging-strips are inserted in place between the rings and the sides of the excavation, said strips being supported by their hooks upon the lowermost ring. In practice each lagging-supporting ring is not expanded until after both sets of abutting lagging-strips associated therewith are in place. This arrangement enables the upper ends of the lagging-strips when inserted in place to be thrust upwardly behind the lower ends of the lagging-strips of the next superjacent unexpanded section of lagging, so as to permit the lower ends of the strips being inserted to be passed above the lowermost ring to the space between said ring and the sides of the excavation, as shown in Fig. 2. After the lower end of each lagging-strip has passed the lowermost or last-inserted ring the strip is dropped to engage its supporting-hook with the upper margin of the ring. It will be seen, therefore, that when following such practice two of the lagging-supporting rings next adjacent to the bottom of the excavation are suspended from superjacent rings through the medium of suspending-rods 33, as shown in Fig. 2. As each ring and its associated lagging-section is expanded or pressed outwardly such section of the lagging is held in place by its frictional engagement with the sides of the excavation and the suspending-rods, which theretofore spaced the lower supporting-ring of said section and suspended the lagging, is removed. In beginning the excavation the topmost lagging-supporting ring is suspended until after it is expanded by the suspending-rods 33 from horizontal beams 34, extending transversely across the upper end of the excavation, as indicated in dotted lines in Fig.

2. After the excavation has been completed and the last section or course of lagging inserted in place the said excavation is ready to be filled with the material which hardens to constitute the foundation-pier. As the excavation is filled with such material the inner open frames 15, together with the screw-jacks 14 and their fittings 18 and 18^a, are removed from the excavation, while the lagging-supporting rings, together with the lagging, remains as a permanent part of the pier structure.

I claim as my invention—

1. The improvement in the method of constructing concrete foundation-piers in the earth, which consists in digging the excavation, lining the sides of the excavation with successively lower sections of lagging as the work of excavating progresses, separately suspending each section of the lining as it is placed in position and thereafter expanding the suspending means to press the lagging against the sides of the excavation.

2. The improvement in the method of constructing concrete foundation-piers in the earth, which consists in digging the excavation, lining the sides of the excavation with successively lower sections of lagging as the work of excavating progresses, expanding said lagging outwardly against the sides of the excavation, and suspending each section of lagging after it is inserted in place and before it is expanded from a superjacent expanded lining-section.

3. Means for placing and supporting successively lower sections of lagging in an excavation in the earth formed to receive a concrete pier, embracing means located at the level of each section of lagging for preliminary suspending the same and means thereafter acting on the lagging-suspending means for pressing the lagging outwardly against the sides of the excavation.

4. Means for placing and supporting successively lower sections of lagging in an excavation in the earth formed to receive a concrete foundation-pier, comprising expansible lagging-supporting rings located severally at the levels of the sections of lagging and means for expanding said rings outwardly.

5. Means for supporting the lagging in an excavation in the earth formed to receive a concrete foundation-pier, comprising expansible lagging-supporting rings, an open frame located within each ring and expanding devices interposed between said open frames and the lagging-supporting rings.

6. Means for supporting the lagging in an excavation in the earth formed to receive a concrete foundation-pier, comprising expansible lagging-supporting rings, an open frame located within each ring, and jack-screws attached to the central open frames and acting at their outer ends against said lagging-supporting rings.

7. Means for supporting the lagging in an excavation in the earth formed to receive a concrete foundation-pier, comprising expandible lagging-supporting rings, a centrally-located open frame located within each ring, and jack-screws attached to said central frames and extending outwardly and detachably connected at their outer ends with said lagging-supporting rings.

8. Means for supporting the lagging in an excavation in the earth formed to receive a concrete foundation-pier, comprising a plurality of vertically-separated, expandible lagging-supporting rings, means acting on the rings to expand the same outwardly, and thereby press the lagging against the sides of the excavation, and means for suspending each successively lowermost ring, as the excavating-work progresses, from a higher expanded ring until the lagging is inserted between said lower ring and the side of the excavation and the said lower ring and lagging expanded outwardly.

9. Means for supporting the lagging in an excavation in the earth formed to receive a concrete foundation-pier, comprising a plurality of expandible lagging-supporting rings, means acting against the rings to expand the same outwardly and thereby press the lagging against the sides of the excavation, and suspending-hooks for spacing a lower unexpanded ring from an upper ring, and for suspending said lower ring until the lagging is

applied thereto and the lagging supported thereby pressed outwardly.

10. The art of building foundation-casings which consists in positioning expandible casing-rings, then introducing the lagging behind the rings, and then expanding the rings.

11. The art of building foundation-casings for wells which consists in positioning expandible casing-rings, then introducing the lagging behind the rings, and then expanding said rings by means of jacks until the lagging is forced into engagement and pressed against the walls of the well.

12. The art of building sectional foundation-casings which consists in placing the first or top section in position, then positioning the expandible casing-rings for the next lower section and supporting said rings from the first section, introducing lagging around said rings and finally expanding the rings.

13. An expandible casing-ring formed of T-iron, lugs secured to the flange of said T-iron, and jacks engaging with said lugs for the purpose of expanding said rings.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 2d day of November, A. D. 1905.

GEORGE W. JACKSON.

Witnesses:

JAMES J. GRAHAM,
GEO. C. WHARTON.