

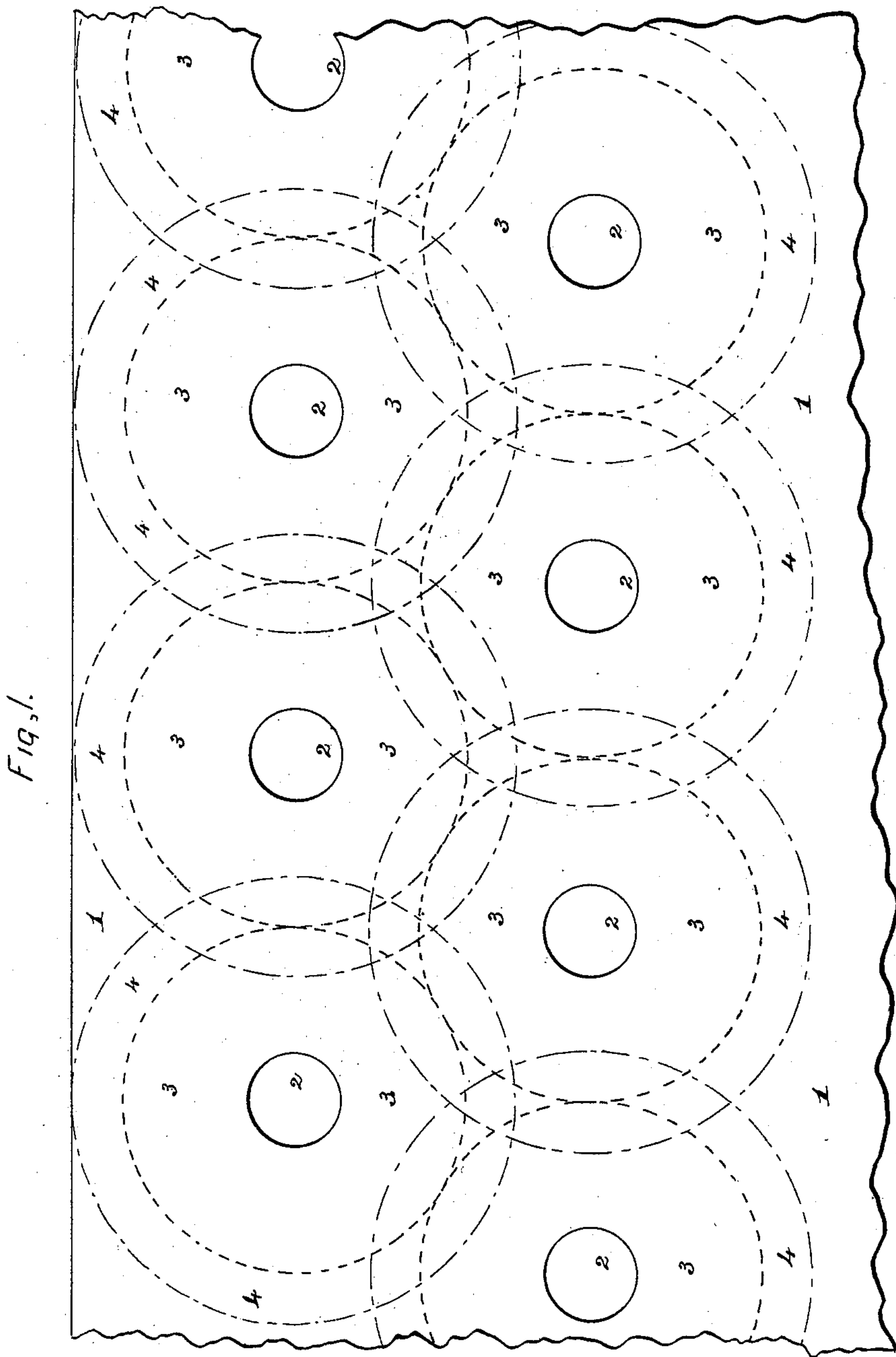
(No Model.)

2 Sheets—Sheet 1.

A. H. EMERY.
PLATE FOR BOILERS.

No. 322,051.

Patented July 14, 1885.



WITNESSES

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Wm. F. Jayer

INVENTOR

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Fig. 2.

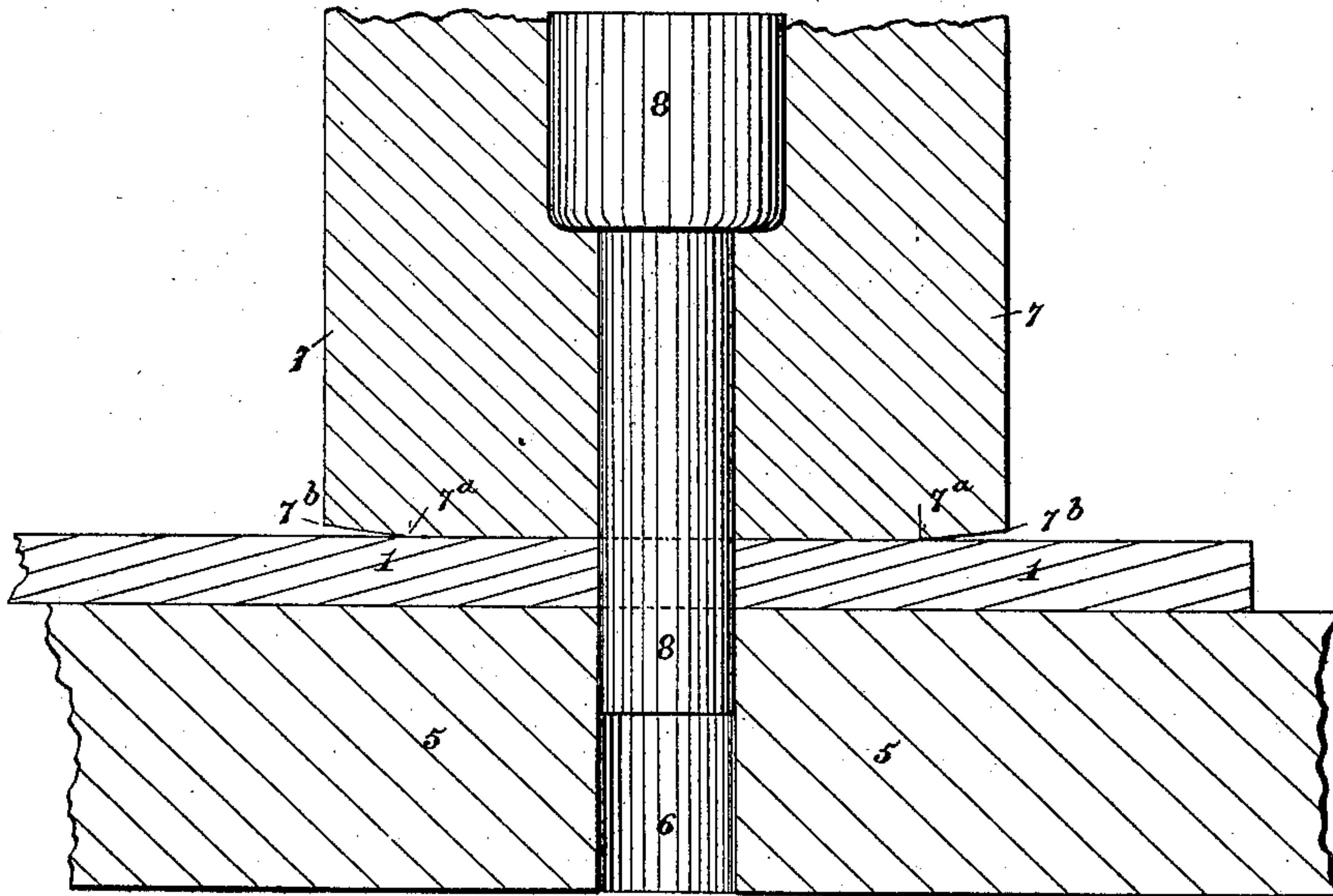
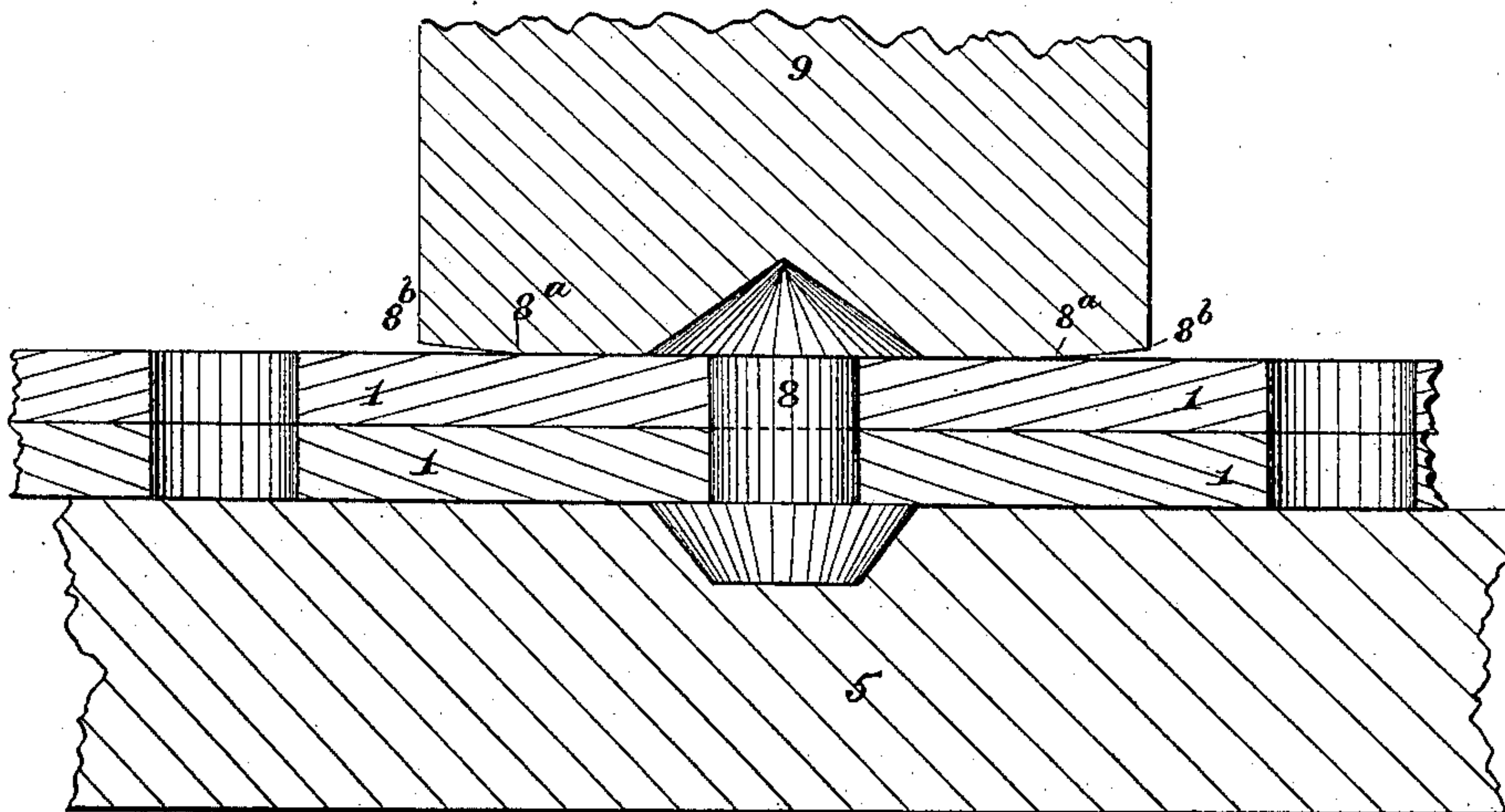


Fig. 3.



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UNITED STATES PATENT OFFICE.

ALBERT H. EMERY, OF STAMFORD, CONNECTICUT.

PLATE FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 322,051, dated July 14, 1885.

Application filed April 13, 1883. (No model.)

To all whom it may concern:

Be it known that I, ALBERT H. EMERY, of Stamford, in the county of Fairfield and State of Connecticut, formerly of the city, county, and State of New York, have invented certain new and useful Improvements in the Manufacture of Boilers, Ships, and other riveted work from Metallic Plates, of which the following is a specification.

10 The object of my invention is to increase the strength of metallic plates used in the manufacture of riveted, bolted, and like work—such as boilers, ships, &c.—and also to increase the strength of structures made up from such
15 plates. To this end I subject the marginal parts of the plates through which the bolt or rivet holes are to be made to compression between rolls or dies while in a cold or moderately heated state, so that the limit of elasticity in
20 the reduced section of this part of the plate, after punching or drilling will be at least as great as the whole section of the unpunched portions, and, when practicable, of equal or greater ultimate strength; or, if preferred, my invention may be carried out by
25 compressing the metal around the bolt or rivet holes or the places where they are to be made to a sufficient distance to extend beyond the heads of the bolts or rivets. In the latter mode
30 of carrying out my invention it is preferred to have the compressed portions extend to a sufficient radial distance to overlap one another.

Another mode of carrying my invention into effect, which possesses some special advantages, consists in compressing the metal around the bolt or rivet holes while the punch is in the hole or after the insertion of the bolt or rivet. In this case the metal, under pressure of the dies, is forced closely against the surface of the punch or against the bolt or rivet,
40 as the case may be.

Under either mode of carrying my invention into effect the dies or rolls are formed in such a manner as to exert a reduced pressure
45 on the metal at points adjacent to those at which the maximum condensing pressure is applied, which reduced pressure, while insufficient to cause flowing of the metal, gives friction on the pressing surfaces sufficient to prevent flowing under the greater pressure applied where the metal is to be condensed, and
50 which condensing pressure would cause flow-

ing of the metal if such flowing were not resisted by confining the adjacent metal by pressure and consequent friction, as stated, by a surrounding area of less pressure. 55

One or more plates, prepared by condensing the metal at or near the margins and punching or drilling, as explained, are connected by riveting or bolting as usual, after which, in
60 the case of steam-boilers and other similar structures, the structure is subjected to internal hydraulic pressure sufficient to stretch the metal beyond its elastic limit imparting a permanent set, and resulting in a higher elastic
65 limit, and increased rigidity and ultimate strength in the metal. The strength of the structure is thus materially increased, not only by the results last stated, but because by the stretching operation all parts of the metal
70 acquire such a set that in the future use of the structure the various parts of the plates and all the rivets or other fastenings will be equally strained, so far as practicable, instead of one being relieved at the expense of another, as is the case where the plates are simply riveted together in the usual way. 75

It will be apparent that a boiler or other structure having been stretched in the manner described, so as to impart a sufficient permanent set to the metal, will be prepared to endure its proper strains in use without distortion or overloading any of its parts. 80

My invention is manifestly applicable to plates of various shapes, according to the various purposes for which the structures are designed. The said plates may be in flat or bar form, or in the shape of angle-irons, or irregular in shape. It often happens that some
90 holes are so located, by reason of the peculiar form of the plate or structure, or from other causes, that the compression of the metal around such holes is impracticable or unnecessary. In all such cases the stretching of the structure, so as to impart a considerable permanent set and bring all parts under equable strain, is highly beneficial. 95

Various modes of carrying my invention into effect are illustrated in the accompanying drawings. 100

Figure 1 is a plan of a punched plate, indicating by dotted circles the areas of compressed metal around the rivet-holes. 1 represents the plate, and 2 the rivet-holes therein. 3 are the

areas of condensed metal surrounding the rivet-holes, and 4 the annular spaces surrounding the condensed portions 3 and overlapping each other, where the metal is compressed and held with sufficient force to prevent the flow of metal from the inclosed portions 3 under the heavy pressure applied thereto to permanently condense the metal.

Fig. 2 is a sectional view illustrating the condensing and punching operations. 5 represents a bed-die with an aperture, 6, to discharge the punchings. 7 represents the upper compressing-die, and 8 a punch working therein, and driven by a hydraulic ram or other adequate and usual means, so as to perforate the plate 1. The compression-die 7 is also pressed down by a hydraulic ram or other adequate means with sufficient force to condense the metal in that portion of the plate 1 on which it acts, so as to impart a permanent set. The face of the said die is formed with a precisely straight or level face from 7^a to 7^b, so as to exert its maximum pressure over this area and permanently condense the metal in the portion 3 of the plate, and with a very slightly receding surface from 7^a to the margin 7^b, so as to apply over the annular surface 4 a reduced pressure which, while insufficient to cause a flow of metal or produce any considerable condensation or permanent set therein, will suffice to prevent any outward flow of metal from the inclosed portion 3 to which the maximum pressure is applied to condense the metal. The compression and condensation of the metal may take place either before or after punching. In the latter case (which is the preferred mode) the punch remains in the hole during the compression of the metal, and in the former case the pressure is maintained during the punching.

Fig. 3 is a sectional view illustrating a mode of compressing and condensing the metal during or subsequently to the riveting operation. In this figure 5 represents the bed-die; 1 1, the two parts of the plate; 8, a rivet connecting them, and 9 the riveting-tool. The face of the said tool is so formed from 8^a to 8^b as to apply condensing pressure and permanent set to the parts 3 of the plates, and between 8^a and the margin 8^b to apply reduced pressure to the surrounding part, so as to prevent outward flow of metal from the central part, where the maximum pressure is received, as before explained.

I am aware that in the ordinary punching of metal plates some condensation of the metal necessarily occurs around the hole, especially near the lower side or that next to the die; but this condensation is not sufficient in degree or extent to accomplish the object of my invention.

I am well aware that the condensation of metal by pressure, either while hot or cold, is not broadly new.

My invention relates to the treatment of metal while in a cold or moderately-heated

state, so that permanent set may be given, and, furthermore, to the condensation of specific parts of the plates, as and for the purposes hereinbefore explained.

By the expression "cold or moderately-heated," I mean that the metal must not be so heated as to impart free ductility to it or adapt it to flow easily under pressure, as in the customary operations of forging and swaging. A boiler plate cold-rolled throughout, so as to be condensed equally all over, will, when subjected to strain, tear first in the punched portion, owing to its reduced section.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. A plate or plates of metal for bolted or riveted work, having a greater density, strength or limit of elasticity in the metal in the parts through which bolts or rivets are passed or to be passed, the said increased density, strength, and limit of elasticity being produced by compressing the said parts of the plates while in a cold or moderately-heated state to a sufficient degree to impart a permanent set, as herein set forth.

2. A plate for the manufacture of boilers, ships, or bridges, or for other like purposes, compressed, while in a cold or moderately-heated state, around the bolt or rivet holes, or the places where such holes are to be made, to a sufficient distance to extend beyond the heads of the bolts or rivets.

3. A plate for the manufacture of boilers, ships, or bridges, or for other like purposes, compressed, while in a cold or moderately-heated state, around the bolt or rivet holes to a sufficient radial distance to cause said compressed portions to overlap each other, or nearly so.

4. A plate for the manufacture of boilers, ships, or bridges, or for other like purposes, compressed, while in a cold or moderately-heated state, immediately around the parts where bolt or rivet holes are made or to be made, and to a less degree around such compressed portion, so as to arrest or prevent the radial or outward flow of metal in the act of compressing the parts immediately around the holes.

5. A plate or plates for the manufacture of boilers, ships, or bridges, or for like purposes, having punched or drilled holes, and with the metal compressed in a cold or moderately-heated state around the bolt or rivet holes to a sufficient extent to produce radial pressure against a punch, drill, bolt, or rivet therein contained, substantially as set forth.

6. A boiler plate or plates connected by bolting or riveting and subsequently stretched, so as to impart a permanent set and greater rigidity and strength to the body.

ALBERT H. EMERY.

Witnesses:

OCTAVIUS KNIGHT,
HARRY E. KNIGHT.