No. 662,125. Patented Nov. 20, 1900.

F. L. LANE.

APPARATUS FOR MANUFACTURING FLANGED FLUES FOR BOILERS.

(Application filed Aug. 11, 1899.)

(No Model.) 6 Sheets—Sheet 1.

Fig 1.

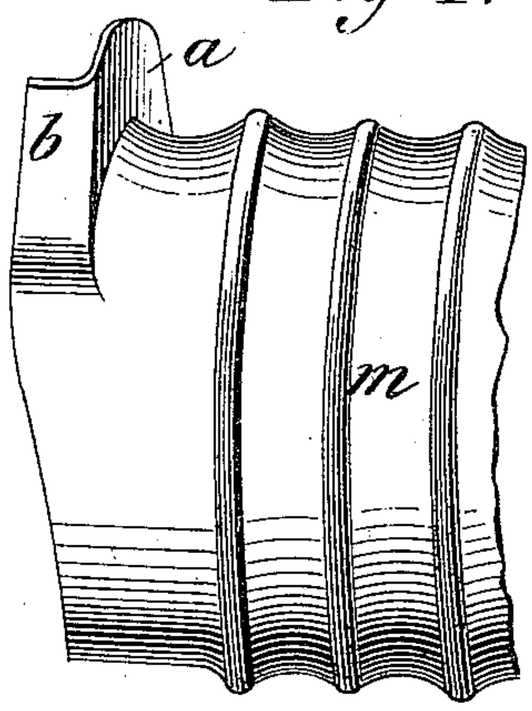

Fig. 2.

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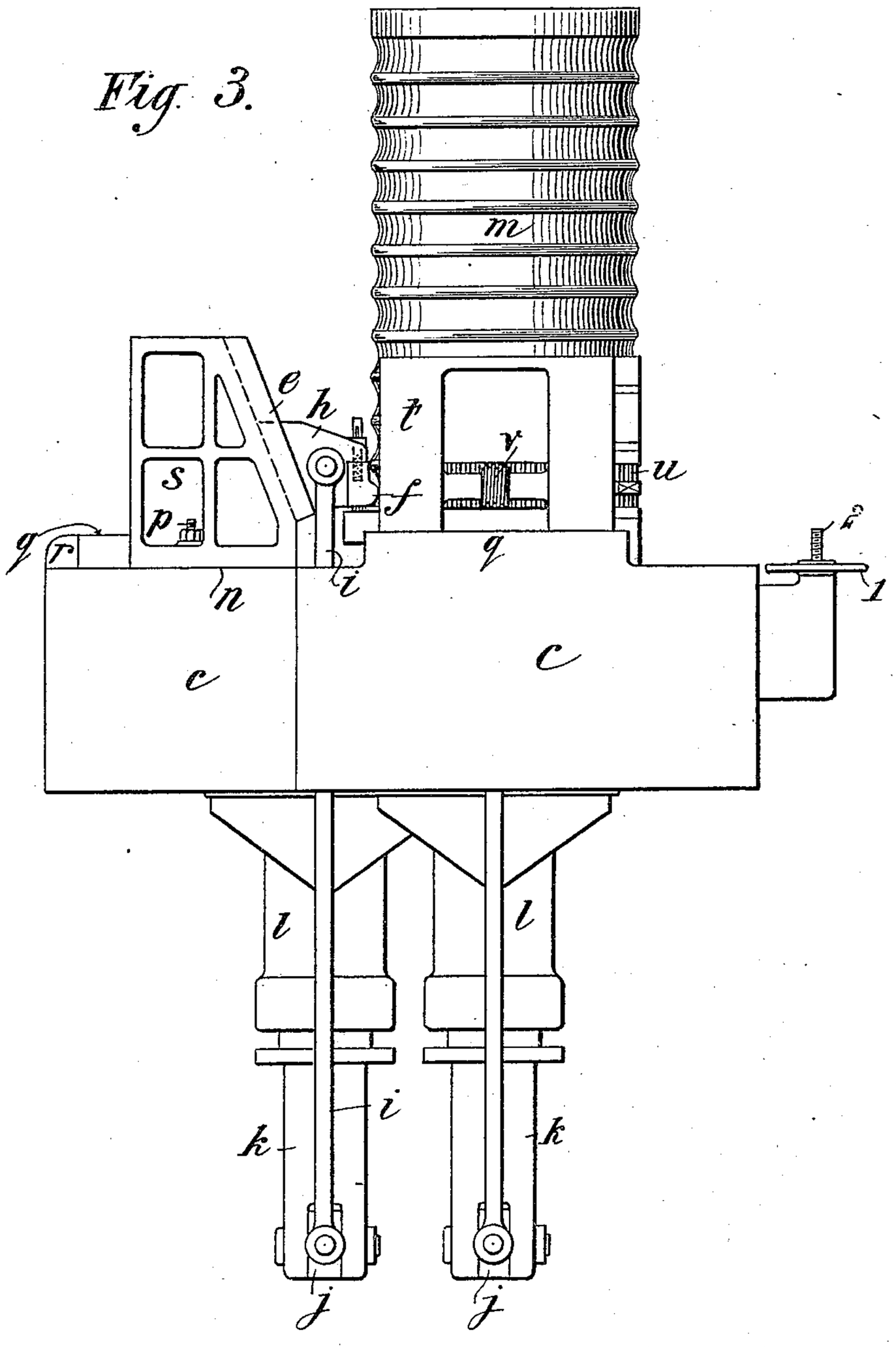
(No Model.) 6 Sheets—Sheet 2.

Fig. 3.



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(No Model.) 6 Sheets—Sheet 3.

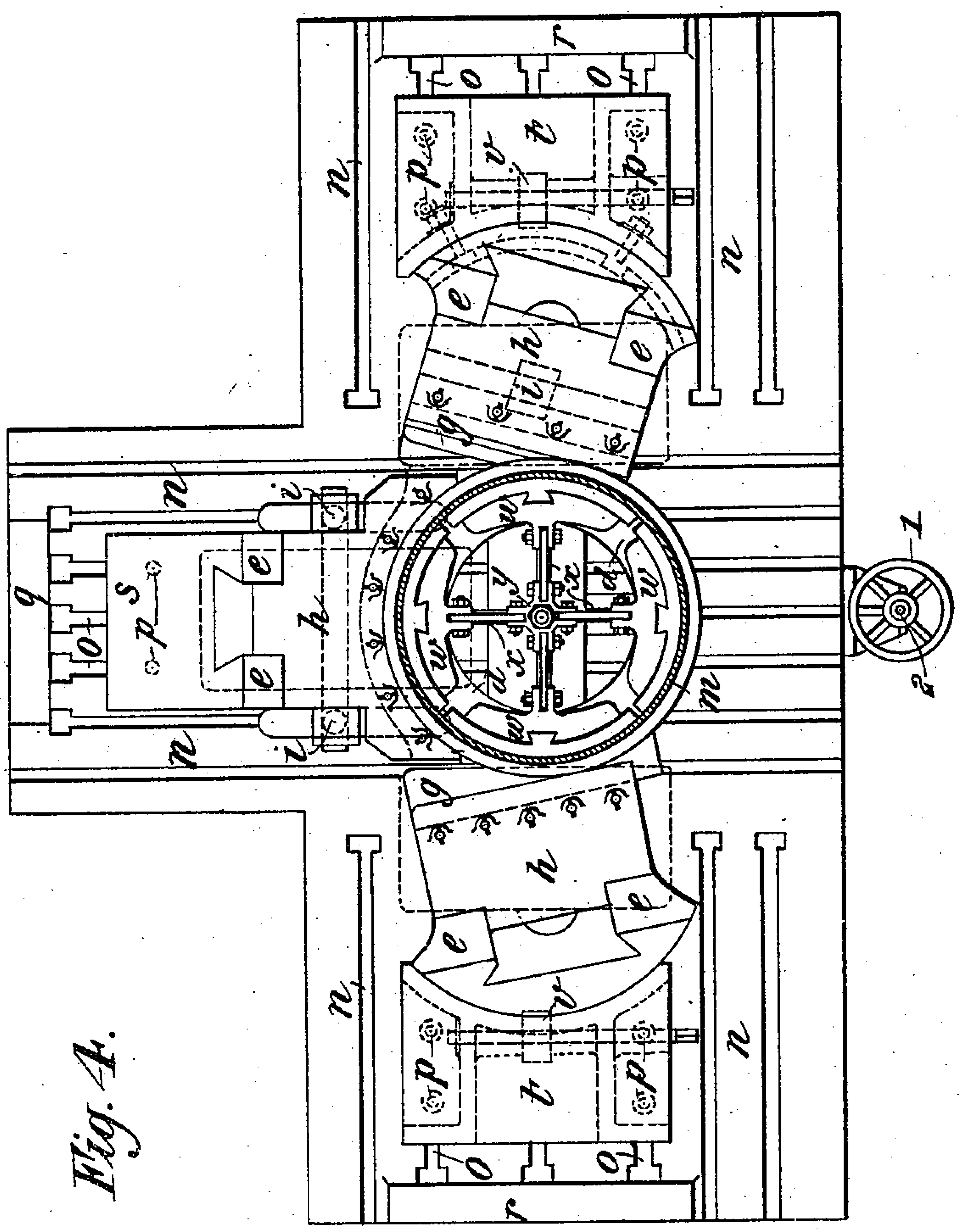

Fig. 4.

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(No Model.) 6 Sheets—Sheet 4.

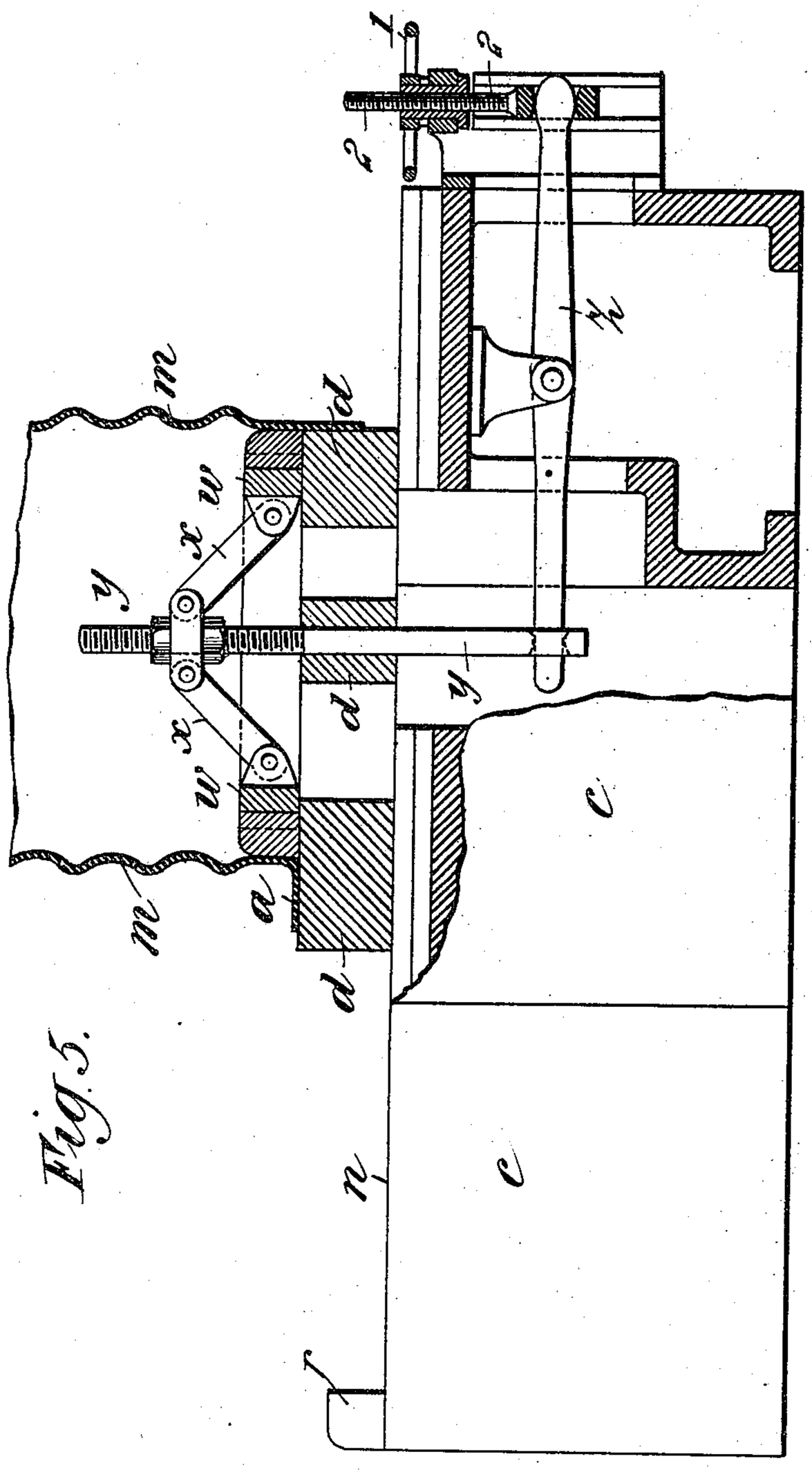

Fig. 5.

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(No Model.) 6 Sheets—Sheet 5.

Fig 7.

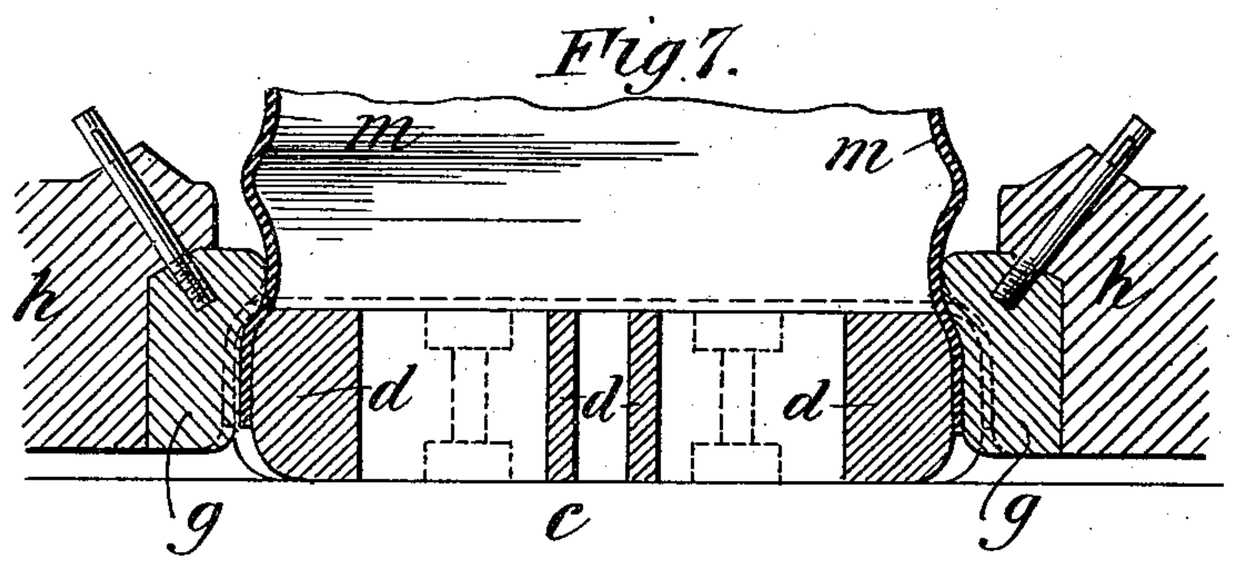


Fig. 6.

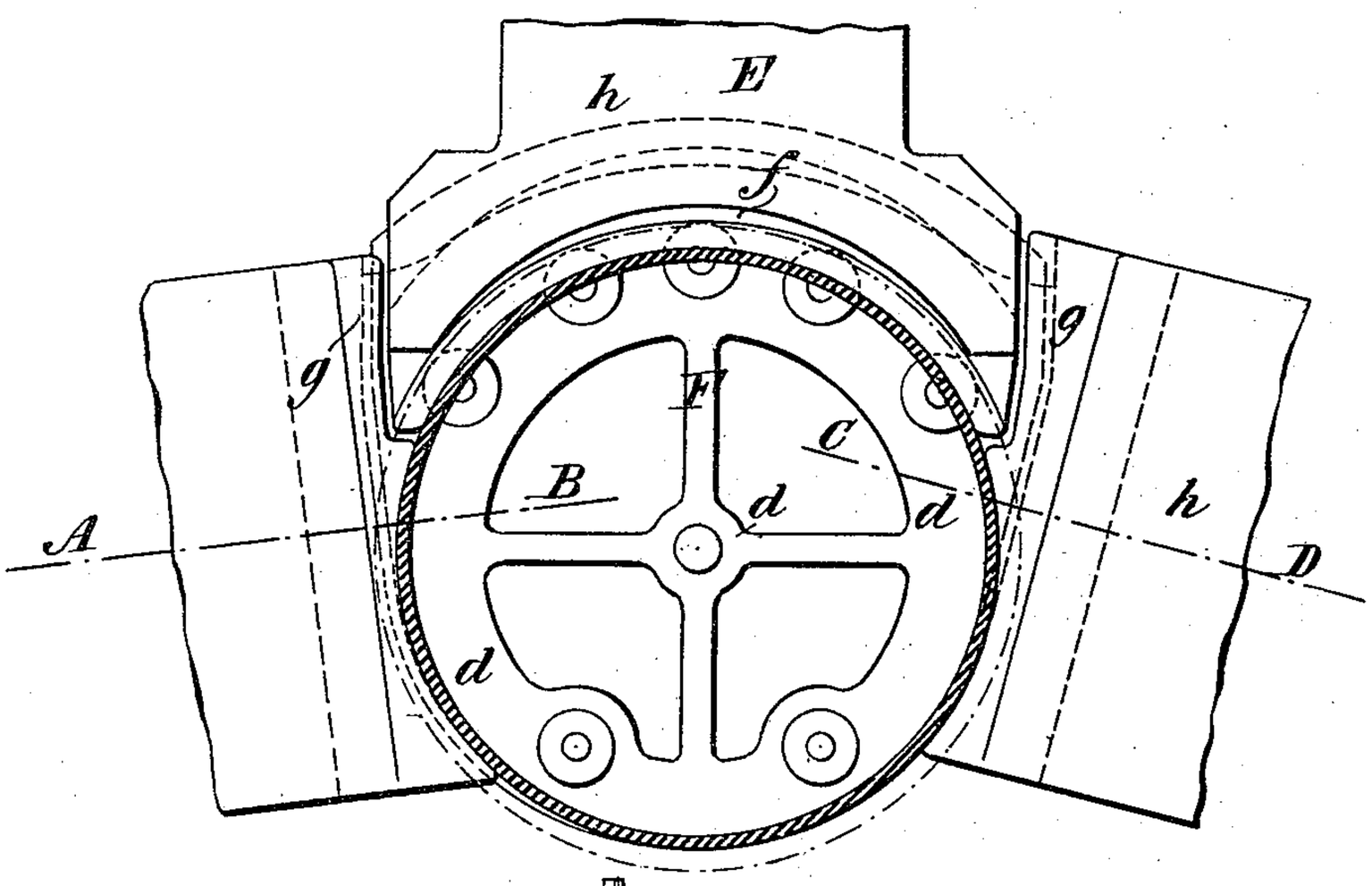
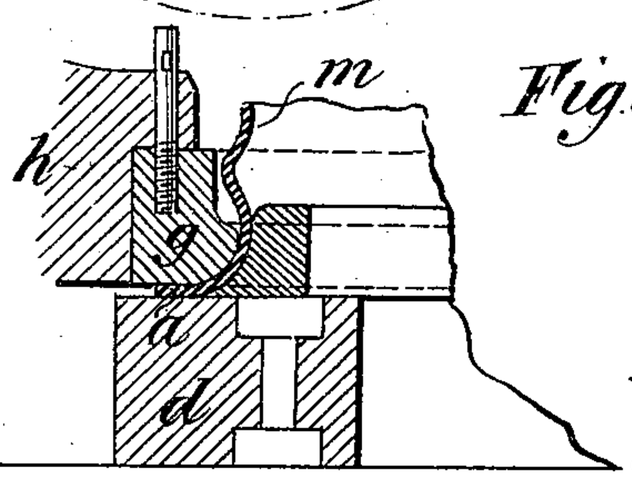


Fig. 8.



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APPARATUS FOR MANUFACTURING FLANGED FLUES FOR BOILERS.

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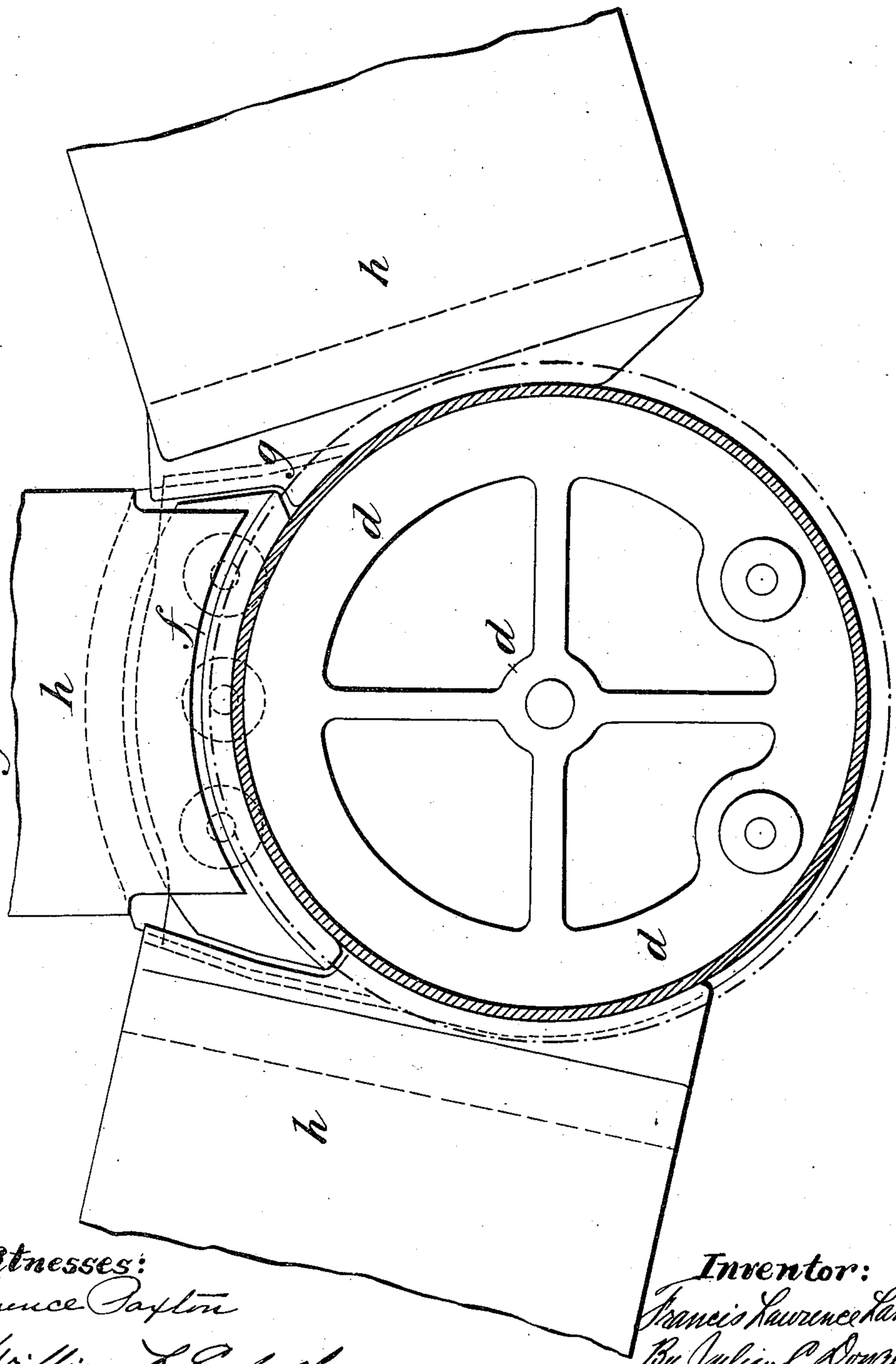

Fig. 9.

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UNITED STATES PATENT OFFICE.

FRANCIS LAWRENCE LANE, OF LEEDS, ENGLAND, ASSIGNOR TO THE LEEDS FORGE COMPANY, LIMITED, OF SAME PLACE.

APPARATUS FOR MANUFACTURING FLANGED FLUES FOR BOILERS.

SPECIFICATION forming part of Letters Patent No. 662,125, dated November 20, 1900.

Application filed August 11, 1899. Serial No. 726,906. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS LAWRENCE LANE, a subject of the Queen of Great Britain and Ireland, residing at Leeds, in the county of York, England, have invented Improvements in Apparatus for Manufacturing Flanged Flues for Boilers, of which the following is a specification.

It is usual to make boiler-flues with a tube-plate flange whose direction is at right angles to the axis of the flue and with reverse flanges at the two opposite edges of the tube-plate flange, these reverse flanges merging into the wall of the circular or approximately circular portion of the flue. Although it has been attempted in the manufacture of such flues to produce the reverse flanges by machinery, yet so far as I am aware the results of such attempts have not been satisfactory, and in practice it is usual to form the said flanges by hand, which is a tedious and expensive operation, involving several reheatings and considerable time and labor.

Now this invention has reference to the formation of the reverse flanges after the metal has been bent and welded into the form of a flue (corrugated if desired) and after the tube-plate flange has been formed by bending an appropriately-shaped end portion or prolongation of the flue-wall into a plane at right angles, or approximately so, to the longitudinal axis of the flue, (whether in the ordinary or any convenient manner).

The formation of the reverse flanges according to this invention is effected by heating the metal to a suitable temperature and operating upon it by means of flanging-dies actuated by hydraulic or other power, while the tube-plate flange is held by and between the adjacent surfaces of two parts or bodies, such as (respectively) a presser or flange-holder and a bed or table, one or both of which can by hydraulic or other power be moved toward or from the other and one of which is or may be adapted to itself constitute or to support a "former," between which and the flanging-dies the reverse flanges are formed.

The accompanying drawings illustrate one example of a flue having flanges such as referred to and a construction of apparatus according to this invention for the formation of the reverse flanges in the manner above set forth.

Figure 1 shows in perspective so much of a flue as is needful to indicate in a general way the well-known flange formation it is the object of this invention to produce more readily and economically than heretofore usual. Fig. 2 shows the apparatus in elevation. In this same figure there is shown in section a flue in the flanging position with the return-flanges already formed. In the view of the apparatus itself one of the flanging-dies is shown returned to its upper position, the other flanging-die being shown as still in the position corresponding to completion of the flanging stroke, while the presser or holder is represented as still in its flue-holding position. Fig. 3 shows an elevation of the apparatus at right angles to Fig. 2, a flue being represented with its tube-plate flange being held by and between the presser or holder and the bed or table. Fig. 4 shows a plan of the apparatus. Fig. 5 shows in section parts of the apparatus, including the adjustable central block or retainer, means for adjusting same, the bed or table constituting a former, and part of a flue in position thereon. Fig. 6 shows to a larger scale a plan of the bed or table, the presser or holder, and parts of the dies for forming the return flanges, a flue being shown in the flanging position. Fig. 7 shows a section partly in line A B and partly in line C D of Fig. 6. Fig. 8 shows a section in line E F of Fig. 6. Fig. 9 shows a similar view to Fig. 6 of a modified arrangement.

In Fig. 1, *a* is the tube-plate flange. *b b* are the reverse flanges.

Referring to Figs. 2 to 8, inclusive, the bed or table *c* is provided with a flange-former *d*, suitably fixed, and has arranged near it ways or guides *e*, on which the pressure or flange-holder *f* and the flanging-dies *g* can be caused to travel. The former *d* may in some cases be replaced by a number of formers—for instance, one for each reverse flange to be produced. The flanging-dies *g* are mounted on blocks or carriages *h*, able to travel on such inclined ways *e* and connected by suitable rods *i* and cross-heads *j* to the plungers *k* of hydraulic rams *l*, the upper rod *i* being connected at a swivel to the upper cross-head *j*,

which latter is connected by two other rods *i* to the lower cross-head *j*, to which the said rods are pivoted, and the last-mentioned cross-head *j* being able to turn about the pin which attaches it to the plunger *k*, by which arrangement the connecting-rods *i* are enabled to oscillate to the necessary extent in relation to the rams, and after the flue *m* has been secured in position the flanging-dies *g* can be operated so as between them and the former *d* to form the reverse flanges *b* while the metal is in a sufficiently-heated condition. It is preferred to effect the formation of the reverse flanges *b* at one heat where practicable. The presser or flange-holder *f* is also mounted on a block or carriage *h*, that travels on an inclined way or ways *e*, and is connected to the plunger *k* of a hydraulic ram *l* by means of two rods *i*, which are pivoted to the block or carriage and to a cross-head *j*, which is itself secured by a pin (about which it can turn) to the said plunger *k*. The inclined ways *e* are adjustable toward and away from the axis of the flue *m* and are capable of being secured in the required positions. For this purpose the said ways *e* are mounted on the parts *n* of the bed *c*, each of which parts is formed with T-shaped grooves *o* to receive the heads of bolts *p*, whose stems pass up through suitable holes in the castings which carry the inclined ways and are secured by means of nuts screwed onto the bolts in a manner well understood, packing-pieces *q* being introduced between the said castings and the abutments *r*, formed on the said parts *n* of the bed *c*.

In the example the inclined ways for the sliding block or carriage of the presser or flange-holder are integral with the corresponding casting *s*. The inclined ways *e* of the flanging-dies *g* can be set with their faces at any desired angle to that or those of the inclined way or ways on which the presser or flange-holder *f* travels, thereby enabling flues to be formed with reverse flanges *b* either parallel, approximately parallel, or divergent. For this purpose the said inclined ways *e* are formed or provided with vertical backs, which are partly circular in plan (see Fig. 4) and which bed against suitably-formed standards *t*, to which the inclined ways are secured by T-bolts which pass through the standards, the heads of the bolts being located in suitable grooves formed in the backs of the inclined ways and the bolts being fastened by nuts screwed onto them, as well understood. The curved backs of these ways are formed with worm-segments *u*, engaged by worms *v*, carried by the standards *t*, whereby the inclined ways *e* can be turned as required. Other means of adjustment may be employed.

The shape of the presser or flange-holder will depend on circumstances. In Fig. 6 it is shown of a form suitable for the reverse flanging of a "wing" or outer flue. In Fig. 9 it is represented of a shape suitable for use in the case of a central flue.

The shapes of the former *d* and of the flanging-dies *g* will vary according to the precise form of the return-flanges to be produced. The former *d* might be made integral with the bed *c*. Other means might be employed to actuate the presser or flange-holder and the flanging-dies. They might, for example, be worked by steam-power or by screws; but the hydraulic arrangement, of which an example is shown, is deemed preferable.

The drawings show a central retainer over which is placed that end of the flue at which the tube-plate flange is formed. This central retainer when used is intended to retain or aid in retaining the end of the flue in a suitable position for the reverse-flanging operation. The central retainer might be in the form of a circular block; but in the example it is made adjustable as to its diameter or width within certain limits, so that before or, if necessary, after the end of the flue has been placed in position the central retainer can be expanded radially, so as to touch the inner surface of the wall of the flue and also contracted again to enable the flue to be readily removed. For this purpose it comprises a number of segments *w*, provided with part rings at their peripheries and connected by links *x* to a vertical rod *y*, actuated through a lever *z*, worked by a nut-wheel 1 through a screw 2, Fig. 5; but the central retainer is not in all cases required. Other means might be substituted. Before operating upon the metal for the purpose of producing the reverse flanges the metal is to be heated to a temperature suitable for flanging, as is well understood in the manufacture of flues of the type in question.

What I claim is—

1. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, means for holding said tube-plate flange against said former a flanging die or tool able to travel along inclined ways and means for operating same so as to bend the metal and to produce the desired reverse flanges between said former and said flanging die or tool, substantially as described.

2. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, a presser or flange-holder, means for causing same to hold the tube-plate flange of the flue against said former, flanging dies or tools able to travel along inclined adjustable ways and means for operating same so as to bend the metal and to produce the desired reverse flanges between said former and said flanging dies or tools, substantially as described.

3. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, a presser or flange-holder, means for operating same, flanging dies or tools able to travel along inclined ways and means for operating said dies or tools, as set forth.

4. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, a presser or flange-holder able to travel along an inclined way, means for operating same, flanging dies or tools and means for operating same, as set forth.

5. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, a presser or flange-holder able to travel along an adjustable inclined way, means for operating same, flanging dies or tools and means for operating same, as set forth.

6. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, a presser or flange-holder, means for operating same, flanging dies or tools able to travel along adjustable inclined ways and means for operating said dies or tools as set forth.

7. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, a presser or flange-holder, means for operating same, flanging dies or tools able to travel along inclined ways adjustable radially toward and from the axis of the flue and also angularly relatively to each other and means for operating said dies or tools, as set forth.

8. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, a presser or flange-holder able to travel along an inclined way, means for operating same, flanging dies or tools able to travel along inclined ways, and means for operating same, as set forth.

9. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, a presser or flange-holder able to travel along an adjustable inclined way, means for operating same, flanging dies or tools able to travel along inclined ways, and means for operating same, as set forth.

10. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, a presser or flange-holder able to travel along an adjustable inclined way, means for operating same, flanging dies or tools able to travel along adjustable inclined ways, and means for operating same, as set forth.

11. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, means for holding the tube-plate flange against said former, flanging dies or tools, means for operating same and a central retainer whereby the flue is held in position, as set forth.

12. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a former, means for holding the tube-plate flange against said former, flanging dies or tools, means for operating same and a central retainer adjustable as to its diameter and comprising a number of segments connected by links to a vertical movable rod, as set forth.

13. For producing reverse flanges on a flue already formed with a tube-plate flange, an apparatus comprising a bed having a former and inclined ways fixed thereon, a presser or flange-holder and flanging-dies able to travel on said inclined ways and operated by the plungers of hydraulic rams secured beneath the bed, as set forth.

14. For producing reverse flanges on a flue already formed with a tube-plate flange, an apparatus comprising a bed *c* with abutments *q* and having a former *d* and inclined ways *e* thereon, a presser or flange-holder *f* and flanging-dies *g* mounted on blocks or carriages *h*, hydraulic rams *l* secured beneath the bed *c* and rods *i* and cross-heads *j* connecting said blocks or carriages *h* to the plungers of said rams, as set forth.

15. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of standards *t* fixed to the bed of the apparatus and formed with partly-circular faces, inclined ways *e* having vertical backs partly circular in plan and bedding against the faces of the standards, worm-segments *u* on the inclined ways and worms *v* carried by the standards, as set forth.

16. In an apparatus for producing reverse flanges on a flue already formed with a tube-plate flange, the combination of a bed *c*, a former *d* a central retainer comprising segments *w* having part rings, and means for varying the diameter of said retainer for the purpose specified consisting of a vertically-moving rod *y*, links *x* connecting each of said segments thereto and a lever engaging said rod and worked by a nut-wheel 1 and screw 2, as set forth.

Signed at Leeds, in the county of York, England, this 3d day of July, 1899.

FRANCIS LAWRENCE LANE.

Witnesses:

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JAMES S. JEPSON.