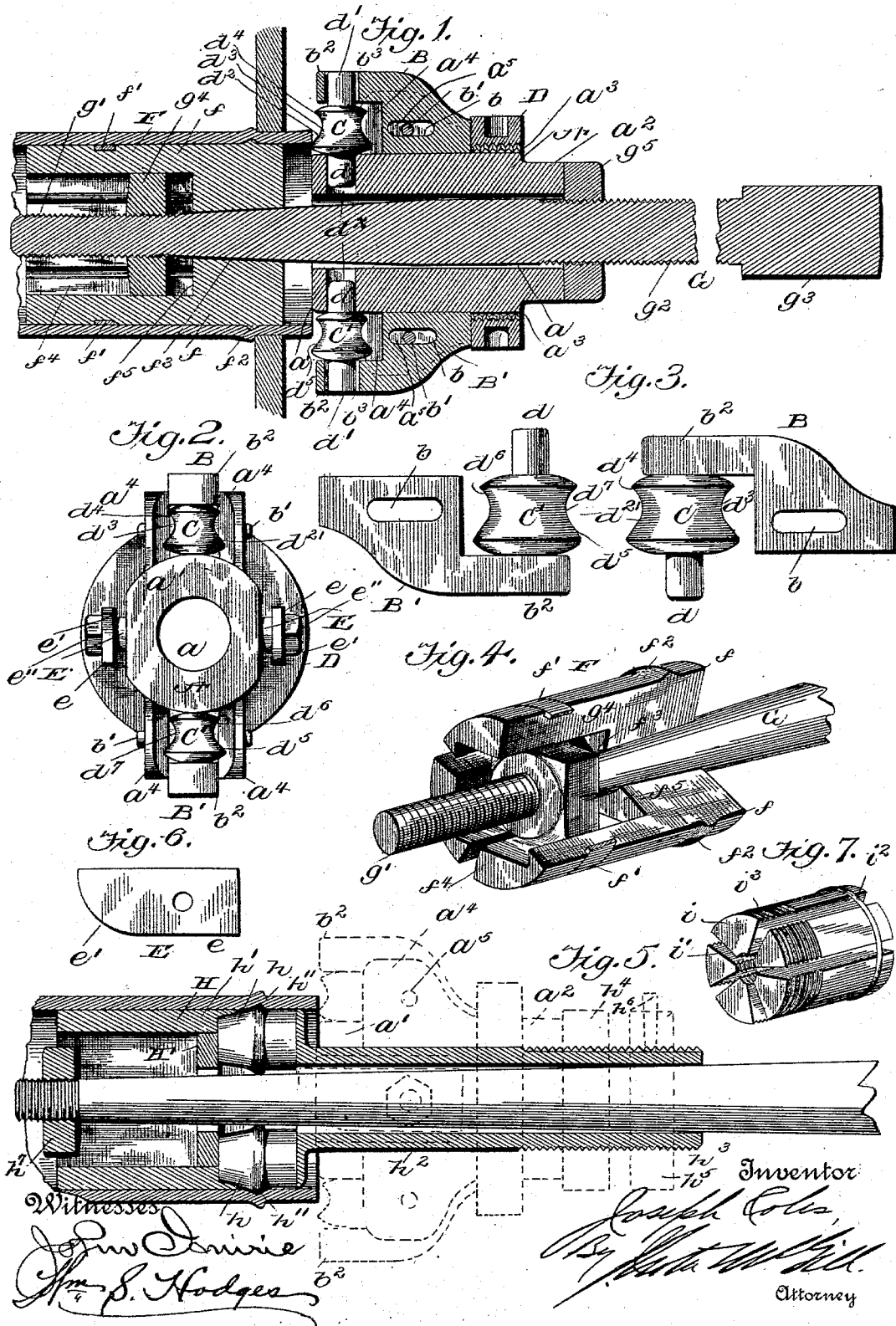


(No Model.)

J. COLES.
FLUE EXPANDER AND BEADER.

No. 514,588.

Patented Feb. 13, 1894.



UNITED STATES PATENT OFFICE.

JOSEPH COLES, OF ASPEN, COLORADO, ASSIGNOR, BY MESNE ASSIGNMENTS,
TO THE COLES FLUE EXPANDER AND BEADER COMPANY, OF WEST
VIRGINIA.

FLUE EXPANDER AND BEADER.

SPECIFICATION forming part of Letters Patent No. 514,588, dated February 13, 1894.

Application filed October 6, 1892. Serial No. 448,029. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH COLES, of Aspen, in the county of Pitkin and State of Colorado, have invented certain new and useful Improvements in Flue Expanders and Beaders; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention contemplates certain new and useful improvements in flue expanders and beaders, and it has for its object the production of cheap, simple and highly efficient means whereby the flue is braced or expanded on both sides of the flue-sheet, the extreme outer end of said flue being turned or beaded tight against the outer surface of said flue sheet.

The invention comprises an expanding and beading machine having two differential rollers, one being designed to give the initial expansion and beading to the flue, and the other to complete the expansion and beading thereof, aided by said initial roller.

The invention further comprises an expanding and beading machine having two diametrically opposed differential rollers for successively and conjunctively acting upon the end of a flue, and means for adjusting said rollers and holding them in fixed relation to the end of such flue.

The invention further comprises an expanding and beading machine having differential rollers for successively and conjunctively acting upon the end of a flue for expanding and beading the same, arms supporting said rollers, and means for sliding and adjusting said arms whereby said rollers are held up against the flue.

The invention further comprises a mandrel for interiorly engaging and bracing the end of a flue, composed of a series of members or segments yieldingly held together and designed to be expanded by a tapered rod.

The invention further comprises a mandrel for interiorly supporting the end of a flue and expanding the same at a point immediately back of the flue-sheet, said mandrel being composed of a series of members and

having an exterior flange or shoulder for forming a swell or corrugation in the flue.

The invention further comprises a mandrel for interiorly supporting the end of a flue and forming a swell or corrugation therein, said mandrel consisting of a series of members or segments having an exterior flange, interior squared and circular openings, a guide located in said squared opening, and a tapered mandrel rod for expanding said members or segments and working in a threaded opening in said guide, whereby the members or segments of the mandrel are held expanded during the operation of the expanding and beading rollers.

The invention further comprises the details of construction, combination and arrangement of parts, substantially as hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings:—Figure 1 is a vertical longitudinal sectional view of my improved expander and beader, shown in connection with the end of a flue. Fig. 2 is an end view. Fig. 3 is a detail showing the two arms with their differential rollers placed side by side. Fig. 4 is a view in perspective of the mandrel, with parts broken away. Fig. 5 is a longitudinal sectional view showing a modified form of mandrel. Fig. 6 is a detail. Fig. 7 is a view in perspective of a second modified form of mandrel.

Referring to the drawings, A designates a casting having a central cylindrical bore a and projecting ends a' , a^2 . The latter end is hexagonal or any polygonal shape, to permit of the application thereto of a wrench or other suitable tool, not shown. Adjoining the hexagonal end is a screw thread a^3 on the periphery of the casting. From the casting at diametrically opposite points project ears a^4 , which are arranged in pairs. In each pair of ears are opposite coincident holes a^5 .

B, B' designate two arms having each a slot b . Through these slots project pins b' which at their ends fit in holes a^5 of ears a^4 . These arms have forward right angular ends b^2 which overhang the end a' of casting A and in such overhanging ends are holes b^3 .

C, C' are the differential beading and ex-

panding rollers both of which are provided at their inner and outer ends with short studs d , d' , the former loosely fitting in recesses d^x in the end a' of the casting, and the latter, or
 5 outer studs d' , in the holes b^3 of arms B, B'. The arms being similar both rollers maintain the same relative position with regard to the end of the flue. I term these rollers "differential" because of the difference in their con-
 10 tour. The object of making the rollers different from each other is to cause one roller to act first on the end of a flue until the latter is expanded and beaded to a certain degree, when the other roller will begin to act and in
 15 conjunction with the initially acting roller will complete the beading of the flue. Hence the roller C is provided with an inner inclined wall d^2 terminating in a circumferential groove d^3 , the outer wall d^4 of which is
 20 slightly concaved. The contour of the roller C' is the converse of that of the roller C, that is, the outer wall d^5 is inclined, and the inner wall d^6 of the groove d^7 is slightly concaved. Thus the inner inclined wall d^2 of roller C first
 25 acts upon the end of the flue and as the latter is expanded and is engaged by the central groove d^3 , the outer inclined wall d^5 of roller C' begins to act on the end of the flue, and, aided by the initial roller C, effects the complete
 30 expansion and beading of the end of the flue. The extent to which the flue is expanded is regulated entirely by the inclination at which the rollers are held relatively to the casting and end of a flue.

35 D is a ring or collar having a central threaded opening and designed to engage with and work on the screw thread a^3 of the casting. By moving this ring or collar inward it will bear against the ends of the arms B, B' and cause
 40 the same to move forward and effect the tilting of the rollers.

From the sides of casting A project short studs or posts E upon each of which is supported a plate e , said plate having a hole near
 45 one end for said stud, and curved at its outer end, as shown at e' . These plates serve as guides for the operator in the application and operation of the mandrel and form a bearing against the flue sheet during the formation
 50 of the inner swell on the flue. When the swell is formed, the guides are turned to one side, out of the way. These guide-plates can be held fast on the supporting studs by any suitable means, as, for instance, a nut e' working
 55 on the upper end of the stud.

F is a mandrel designed to be located within the flue near the end thereof, and in addition to bracing the end of the flue it is intended to circumferentially expand the flue immediately
 60 back of the flue sheet and thus additionally bind the end of the flue. The mandrel is composed of a series of members or segments f around which is passed a yielding band or ring f' . On the exterior of the man-
 65 drel is a flange or swell f^2 , while in its center is a tapering circular opening f^3 , and a rear square opening f^4 terminating at its inner

end at a shoulder f^5 located between the square and circular openings.

G is the mandrel rod, the main or body por- 70
 tion of which is made slightly tapering; and at the termination of this taper the rod is provided with a screw-thread g' . At the other end of the rod is a second screw-thread g^2 and adjoining the latter is a squared head g^3 . A
 75 square nut g^4 is located in the opening f^4 of the mandrel and through its threaded opening is projected the inner end of the mandrel rod said nut forming a guide therefor. Hence
 80 by turning the latter the nut will gradually be brought up against the shoulder f^5 and hold the segments of the mandrel expanded. A binding nut g^5 is located on the threaded
 portion g^2 of the mandrel rod.

In practice, the mandrel is first inserted 85
 into the flue and by forcing the tapered rod inward the members or segments will be caused to expand and the flange on the mandrel will effect the swelling or corrugation of
 90 the flue at a point immediately back of the flue-sheet. The operator then by turning the mandrel rod will bring the nut g^4 tight up against the shoulder f^5 and thus hold the segments separated. The mandrel being properly
 95 positioned, the operator then applies a wrench, or other suitable tool, to the squared end of the casting and also to the binding nut g^5 , and effects the turning of said casting. The roller carrying arms are adjusted by
 100 turning the ring or collar D. The roller C upon coming in contact with the end of the flue will, by turning of the casting, expand the said end and give it a slight outward
 105 curve or turn, while upon the roller C' coming in contact with the said end of flue, the latter will be further beaded, and by the joint action of both rollers the end of the flue will be forced tight against the flue sheet. How-
 110 ever, just as the roller C' is brought into play the operator gives the casting a slight reverse movement and then turns ring or collar D so as to further move the rollers toward the end
 115 of the flue. Then the previous movement is repeated and the final beading accomplished.

The advantages of my invention are appar- 115
 ent to those skilled in the art to which it appertains. It will be specially observed that by means of the mechanism employed the expansion and beading of the end of a flue can
 120 be readily accomplished and that the operation is simple and the beading successfully effected. It will also be observed that by forming a swell or corrugation in the flue immediately back of the flue sheet a firmer and
 125 better connection is had; and this swell or corrugation is formed by the mandrel which must necessarily be employed to give the flue the proper support during the expanding and beading operation.

The advantage of employing differential 130
 rollers, whereby the end of the flue will be successively acted upon by the two rollers, is that the initial beading being easier accomplished than the final beading, less power is

required in first turning the casting when but a single roller is in contact with the flue. When the flue has thus been initially beaded the casting is given a movement in the reverse direction, and the arms B further adjusted inward by the turning of the ring D, and thereby both rollers are brought into engagement with the end of the flue. This is rendered necessary because in the initial beading the single roller gradually assumes an inclined position and by the readjustment both rollers are squarely presented to the end of the flue. Some flues are thicker than others and thus it is easier to start the beading with one roller than with two, and the initially acting roller forms the gage for the second, or subsequent acting roller. Hence less power is required in starting the beading operation and the parts can be readily readjusted to complete the beading.

While the foregoing is the preferred form of embodiment of my invention yet I do not restrict myself thereto, for without departing from the spirit of my invention the construction and arrangement shown in Fig. 5 may be employed. In this form the mechanism for expanding and beading the projecting end of the flue is the same as that above described, the principal change being in the form of mandrel employed.

The mandrel H consists of a series of rollers h circularly arranged within a cylinder h' , said rollers fitting in openings in said cylinder and loosely held in position by a ring H' which latter also serves as a guide for the mandrel rod. Each roller has a central peripheral swell or flange h'' corresponding to and serving the same purpose as the flange or swell f^2 of mandrel F. From the cylinder h' extends a sleeve h^2 which is projected through the central bore of casing A, and upon its screw threaded end h^3 are two binding nuts h^4, h^5 . The nut h^4 is loose on said thread, while the nut h^5 is rigidly held at the point to which adjusted by a pin or key h^6 . The rigid nut is intended to hold the loose nut at the proper gage during the operation of expanding the mandrel and thus prevent the expanding and beading mechanism from moving out of its proper adjustment. The operation of this form of my invention is substantially the same as that of the preferred form. The tapered mandrel rod is forced inward between the rollers of the mandrel, causing the latter to form a swell or corrugation on the flue immediately back of the flue-sheet. To the hexagonal end of the casting and the loose binding nut a wrench is applied and the casting turned, causing the rollers to successively and conjunctively act upon the end of the flue, effecting the expansion and beading thereof. A nut h^7 is preferably screwed on the inner end of the mandrel-rod to prevent the accidental withdrawal thereof from between the rollers.

In Fig. 7 I have shown a second modified form of mandrel, the same being used when

it is desired to hold or bind the parts without forming an inner swell on the flue. In this form the mandrel is composed of a series of members or segments i , each having an inner threaded groove or recess i' , said segments being yieldingly held together by a band i^2 . On the outer surface of each segment is a fine screw-thread i^3 designed to bite the inner surface of a flue. The mandrel rod employed with this form of mandrel is substantially the same as that shown in Fig. 1, the threaded portion of said rod engaging the grooves of the segments and forcing them apart.

I claim as my invention—

1. A flue expander and beader having differential rollers for successively and conjunctively acting upon the end of a flue, each of said rollers being provided with two tapering walls and a central groove, each of said walls having a different taper, the outer tapering wall of one roller corresponding to the inner tapering wall of another roller, substantially as set forth.

2. A flue expander and beader having two differential rollers one of which gives the initial expansion and beading to the end of a flue and is provided with two tapering walls and a central groove, each of said walls having a different taper, the other of said rollers, in conjunction with the former, completing the expansion and beading, and likewise provided with two walls of different taper and a central groove, the outer wall of said latter roller corresponding to the inner wall of said former roller, substantially as set forth.

3. A flue expander and beader having differential rollers for successively and conjunctively expanding and beading the end of a flue, and adjustable arms controlling said rollers, as set forth.

4. A flue expander and beader having differential rollers for successively and conjunctively expanding and beading the end of a flue, sliding arms controlling said rollers and means for adjusting said arms, substantially as set forth.

5. The herein-described improved flue expander and beader, comprising the casting, the arms loosely held to said casting, the rollers held by said arms, and the adjustable ring or collar for moving said arms independently of said casting, substantially as set forth.

6. The herein-described improved flue expander and beader, comprising the casting having ears projecting therefrom and an external screw thread, the arms loosely mounted between said ears, the rollers held by said arms, and the ring or collar having a threaded opening and adjustable on said screw-thread of the casting, as set forth.

7. The herein-described improved flue expander and beader, comprising the casting having apertured ears, and externally screw-threaded, the arms having slots therein, the cross-pins projected through said slots and supported by said ears, the rollers having end studs, the inner ones of which fit in recesses

in said casting while the outer studs project into holes in said arms, and the ring or collar working in said screw-thread of the casting and designed to move said arms, substantially as set forth.

8. A mandrel having a central opening and a series of circularly arranged members provided with a peripheral flange or swell, an inclosed holder located within said opening in rear of the flange or swell and conforming to the shape of said opening, and designed to bear against projecting portions of said members, and the tapered mandrel rod for directly engaging and forcing said members outward and extended through an opening in said holder, substantially as set forth.

9. The herein-described mandrel composed of a series of yielding members or segments and having a central opening, the tapered mandrel rod for forcing said members or segments apart, and the guide located in said opening engaged by said mandrel rod for holding said members or segments expanded, as set forth.

10. The herein-described mandrel composed of a series of yielding members or segments having a central opening and a peripheral flange or swell, the tapered mandrel rod, and the adjustable guide located in said opening and engaged by said mandrel rod for holding said members or segments expanded, as set forth.

11. The herein-described mandrel composed of a series of members or segments having a central squared and circular opening, a nut located in said squared opening, and the tapered mandrel rod having a threaded por-

tion for engaging said nut and adjusting it so as to hold said members or segments expanded, as set forth.

12. The herein-described mandrel, composed of a series of members or segments having a peripheral flange or swell and a central squared and circular opening, a yielding ring or band encircling said members or segments, the nut located in said squared opening and having a central threaded opening, and the tapered mandrel rod for forcing said members or segments apart and having a screw-thread engaging said nut, substantially as set forth.

13. The combination with a mandrel, of an expanding and beading machine having independently pivoted guides projecting therefrom and designed to bear against said flue-sheet while said mandrel is being operated, as and for the purpose stated.

14. The combination with a mandrel for forming an inner corrugation or swell on a flue in rear of the flue-sheet, of the casting carrying expanding and beading rollers and having studs projecting therefrom, and the guide plates pivoted on said studs and designed to bear against said flue-sheet while said mandrel is being operated, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOSEPH COLES.

Witnesses:

EDWARD J. BOCK,
CHARLES M. ROBERTS.