

No. 726,456.

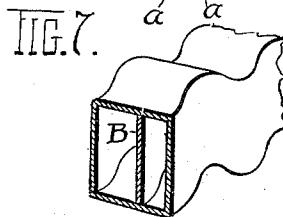
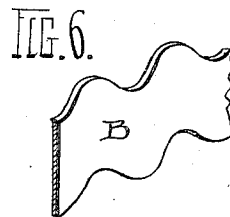
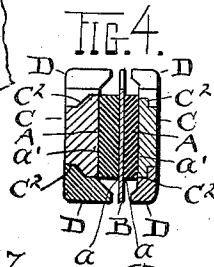
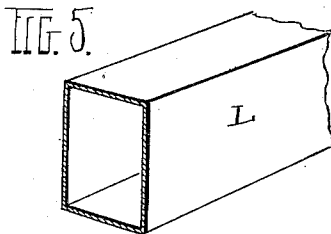
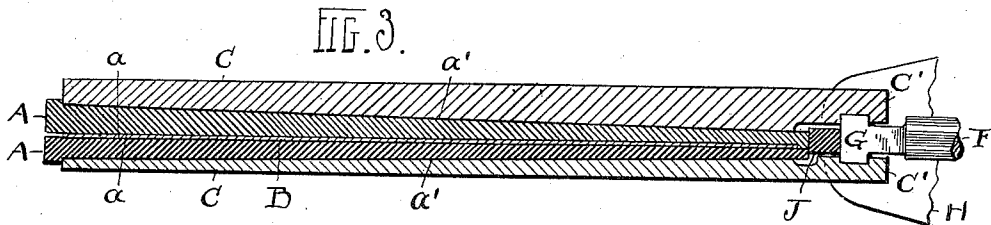
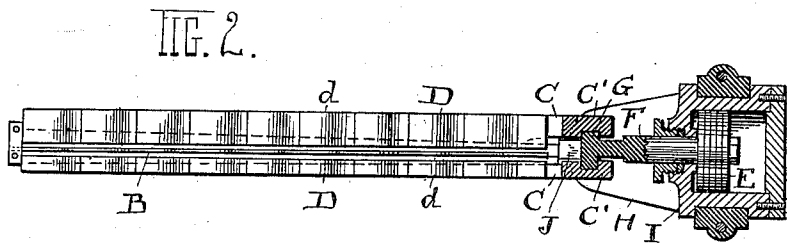
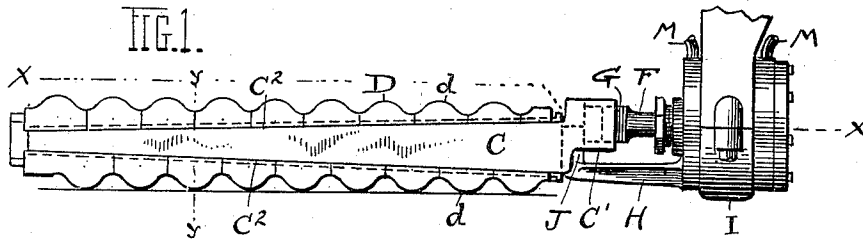
PATENTED APR. 28, 1903.

H. PRENTICE.

MANDREL.

APPLICATION FILED SEPT. 18, 1902.

NO MODEL.



ATTEST

W. B. Moore
W. M. Fisher

INVENTOR

Hugh Prentice

BY *H. V. Fisher* ATT'Y

UNITED STATES PATENT OFFICE.

HUGH PRENTICE, OF CLEVELAND, OHIO.

MANDREL.

SPECIFICATION forming part of Letters Patent No. 726,456, dated April 28, 1903.

Application filed September 16, 1902. Serial No. 123,669. (No model.)

To all whom it may concern:

Be it known that I, HUGH PRENTICE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Mandrels; and I do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in mandrels or cores used in the manufacture of sinuous tubes or forms having a diaphragm and which tube or forms are used in the construction of water-tube boilers; and my improvement consists in the construction and arrangement of parts, all as hereinafter shown and described, and more particularly pointed out in the claims.

The objects of my improvement are, first, to provide a mandrel or core adapted to collapse or contract to smaller dimensions, and whereby it can be easily inserted into and withdrawn from the tube or rough form; second, to provide means for expanding the mandrel or core to the desired size when the mandrel is within the tube or form, and, third, to provide means for carrying a diaphragm into the form with the mandrel or core and leaving the diaphragm in place therein when the mandrel is withdrawn.

In the accompanying drawings, Figure 1 is a side elevation of a mandrel or core and the mechanism associated therein, whereby the objects of my improvement are carried out. Fig. 2 is a horizontal sectional and plan view on line *x x*, Fig. 1, looking down and showing a diaphragm held in the mandrel. Fig. 3 is an enlarged section in plan of the diaphragm-supporting plates and the sliding plates. Fig. 4 is a cross-sectional view on line *y y* of Figs. 1 and 3. Fig. 5 is a perspective view of a portion of a tube or rough form in the shape as it comes to the mandrel. Fig. 6 is a perspective view of the diaphragm which enters and is held and fastened in place within the tube or the form. Fig. 7 is a perspective view of a portion of the tube or form completed.

Referring again to the drawings, wherein similar letters refer to similar parts, it will be seen that the mandrel or core comprises

in part a pair of parallel oppositely-arranged plates A, having meeting faces *a*, constructed to grip and support a diaphragm B when said plates are forced or carried toward each other. Plates A are in turn supported between a pair of side bars or plates C and have a tapering or wedge-shape form end to end on their outside faces *a'*, which abuts against a similar tapering face on the inside of bars or plates C. Plates C are adapted to slide back and forth on plates A to either expand or contract the mandrel from side to side and to hold or to release diaphragm B, and said movement is obtained by a pneumatic or hydraulic pressure operated piston E, which has a ram F, provided with an engaging head G, which interlocks with fingers C' on the end bars or plates C.

An arm H, integral with the cylinder or piston-casing I, has an upright projection J, against which the ends of plates A abut and which serves to hold said plates against end movement.

Side bars or plates C have an additional function to that of expanding and contracting laterally and of clamping or releasing the diaphragm-supporting plates A in their sliding movement, and this is comprised in the construction of said plates C at their top and bottom edges, which are tapered or wedge-shaped to move dies or blocks D outwardly to their proper or engaging position when in rough form L. Said blocks are separately arranged side by side the full length of plates C and rest upon or against the top and bottom tapering or inclined edges C² of each side plate. The outer surface *d* of each block D is curved and shaped to provide a continuous sinuous surface when the blocks are grouped together upon plates C. Plates A and C, with blocks D thereon, combine to make a complete mandrel, which is adapted to be inserted within a rough form, such as seen in Fig. 5. This can be only done when the piston is to the right and said blocks are brought nearer together from opposite sides, or, in other words, when the distance between the sinuous surfaces of the upper and lower blocks is less than the inner diameter or space of the rough form and when plates C are retreated from the sides to the center.

In operation the rough form, which is a me-

tallic tube rectangular in cross-section, is held or supported in the usual manner in the jaws or compressor-dies of the machine used in connection with the mandrel and which
 5 may be of any preferred make or construction and is therefore not shown. The mandrel, with diaphragm B held between plates A, is now brought forward, with its supporting-casing I, and is inserted into form L. Piston E
 10 is then forced forward or to the left under pneumatic or hydraulic pressure, the supply and exhaust connections being had with the piston-chamber, as seen at M. This movement of the piston forces plates C to the left,
 15 expanding the same laterally, and spreads blocks D to their limit of movement within and against the innersides of the tube or form. The compressor-dies of the machine now come together upon the outside of the tube
 20 or form and press the shell or walls of the tube to the sinuous form as outlined by the machine-dies and mandrel-blocks D, and thereby confine and fasten the diaphragm in place. The next step is to release and re-
 25 move the mandrel and blocks, and this is easily accomplished by reason of my improved construction. Thus piston E is set into motion to slide plates C to the right, thereby relieving the pressure of the mandrel against
 30 the inner sides of the tube or form. Plates C free themselves from the side walls of the tube and also act in a similar manner to release blocks D from contact with the upper and lower walls. Pressure thus being re-
 35 lieved on the blocks and plates A and upon diaphragm B, plates C can be withdrawn from the sinuous formed tube, leaving blocks D and plates A free and loose therein to be taken out separately.
 40 Diaphragm B is struck up at its opposite edges in the sinuous form that is finally produced in the tube, and it is inserted in this shape into the rough form.

What I claim is—

45 1. In a mandrel for a machine making serpentine tubes, a set of plates each having a straight tapering wedging-surface from end to end thereof, separate blocks mounted upon said plates opposite said wedging-surface, and
 50 means to slide the plates to force said blocks outward, substantially as described.

2. In a mandrel adapted for use in a machine making serpentine tubes or forms having diaphragms, a set of plates constructed to support a diaphragm and provided with
 55 wedging-surfaces, in combination with a set of sliding plates mounted at either side of said diaphragm-supporting plates, substantially as described.

3. In a mandrel or serpentine-tube-form- 60 ing machine, a set of diaphragm-supporting plates, a series of die-blocks for forming sinuous surfaces, a set of wedging-plates constructed to engage said supporting-plates and said blocks, and means to slide said wedging- 65 plates, substantially as described.

4. In a mandrel adapted for the manufacture of sinuous tubes or forms having diaphragms, a set of supporting-plates for the diaphragms provided with wedge-faces, a series of die-blocks, and a set of sliding plates 70 provided with wedge-faces opposite both said supporting-plates and said die-blocks, substantially as described.

5. A mandrel for sinuous-tube-forming machines comprising a set of sliding plates provided with wedge-surfaces at their top, bottom and side, a set of plates constructed to support a diaphragm and provided with a wedge-surface adjacent the side wedging-sur- 80 faces of said sliding plates, a series of die-blocks provided with wedge-surfaces and mounted upon said sliding plates opposite its upper and lower wedge-surfaces, and means to operate said sliding plates, substantially 85 as described.

6. A mandrel for sinuous-tube-forming machines comprising a set of sliding plates having tapering sides, a pair of diaphragm-supporting plates having tapering sides oppositely supported within said set of sliding 90 plates, a series of die-blocks separately mounted upon said sliding plates, and a piston and ram having interlocking connection with said sliding plates, substantially as described. 95

Witness my hand to the foregoing specification this 23d day of August, 1902.

HUGH PRENTICE.

Witnesses:

R. B. MOSER,

E. M. FISHER.