No. 808,943. PATENTED JAN. 2, 1906.

K. PARK.

APPARATUS FOR FORMING SERPENTINE HOLLOW BODIES.

APPLICATION FILED MAR. 20, 1905.

2 SHEETS—SHEET 1.

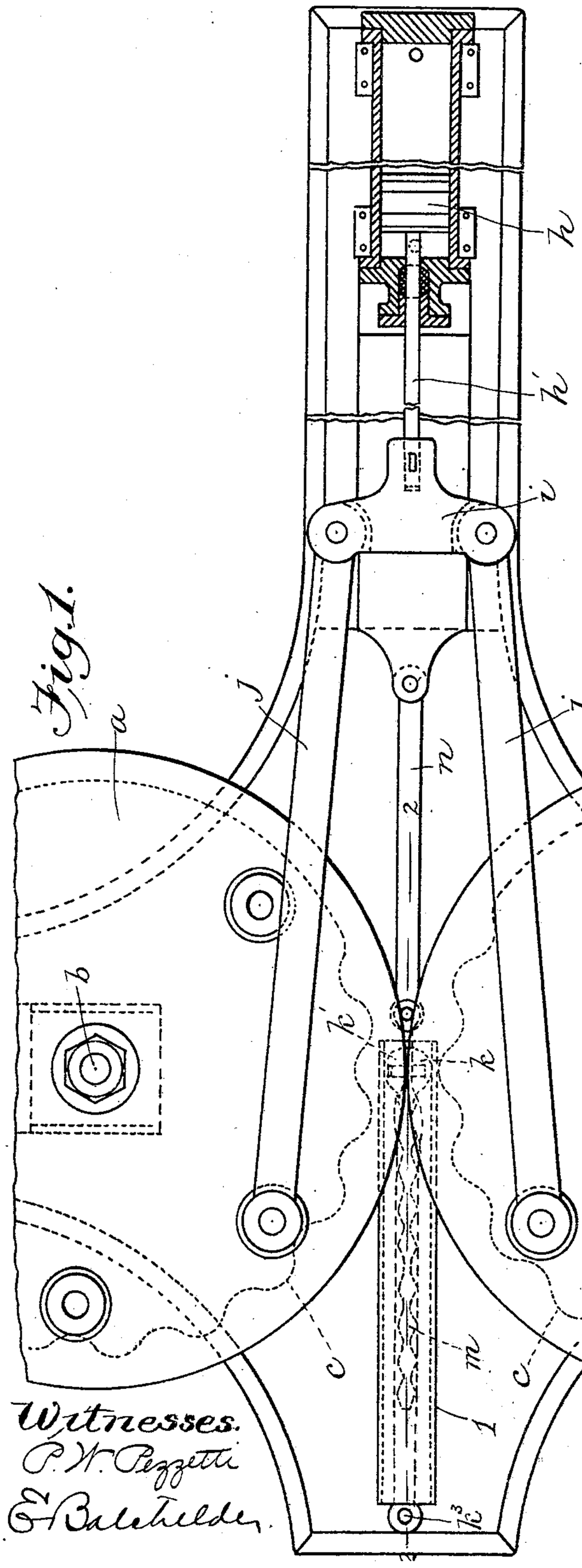


Fig. 1.

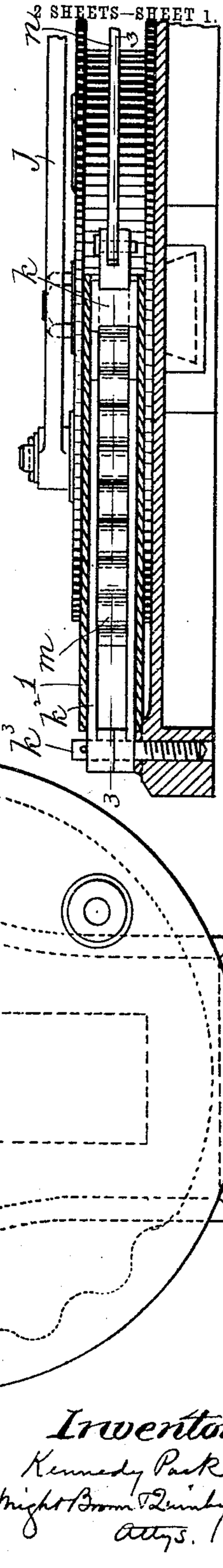


Fig. 2.

Witnesses.
P. W. Pezzetti
E. Baldwin.

Inventor
Kennedy Park
by Wright Brown & Quinby
Attys.

No. 808,943. PATENTED JAN. 2, 1906.

K. PARK.

APPARATUS FOR FORMING SERPENTINE HOLLOW BODIES.

APPLICATION FILED MAR. 20, 1905.

2 SHEETS—SHEET 2.

Fig. 3.

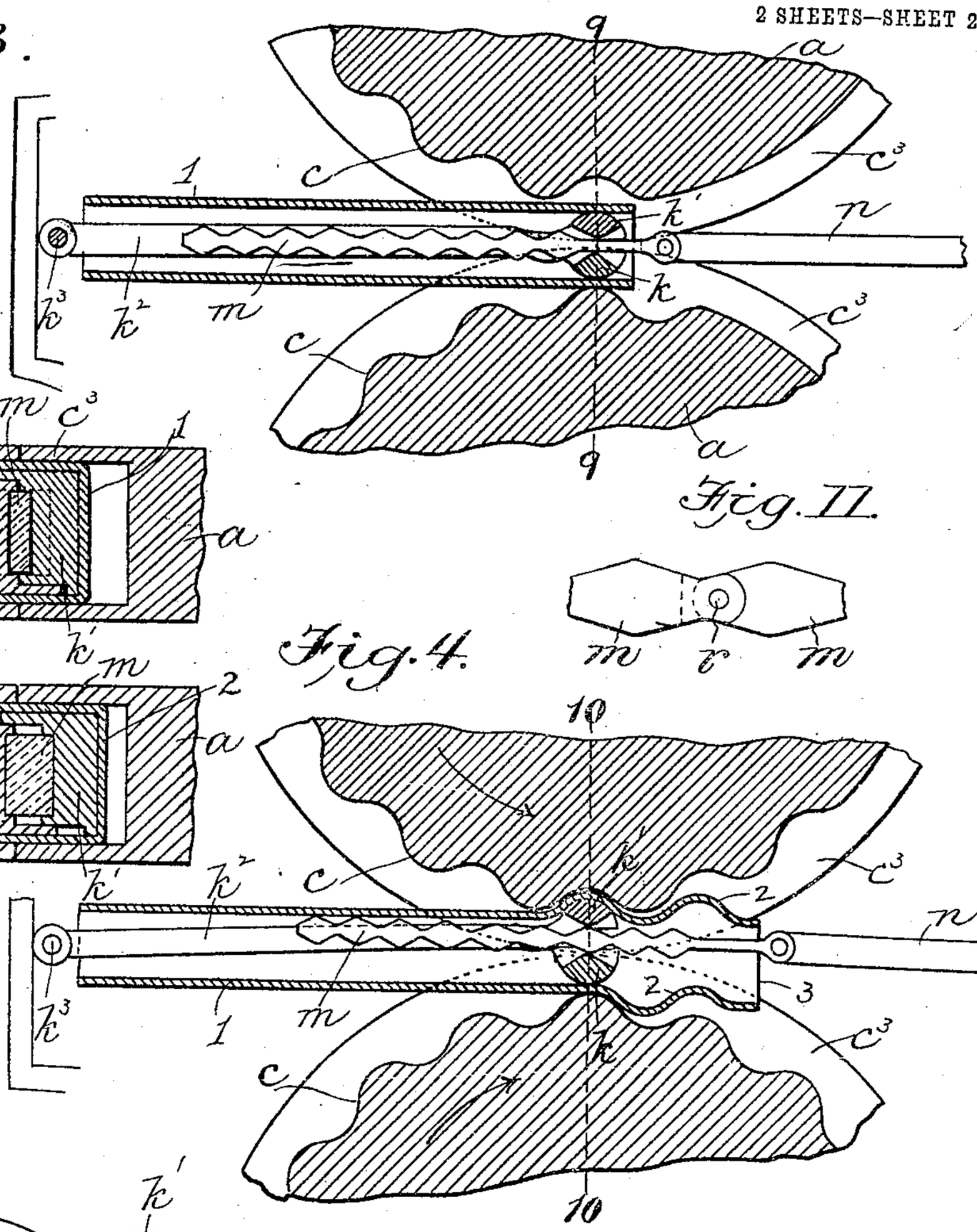


Fig. 9.

Fig. 10.

Fig. 11.

Fig. 4.

Fig. 5.

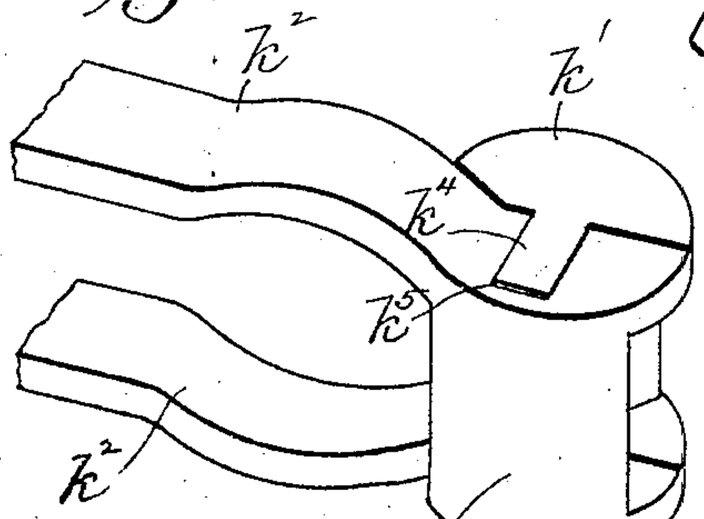
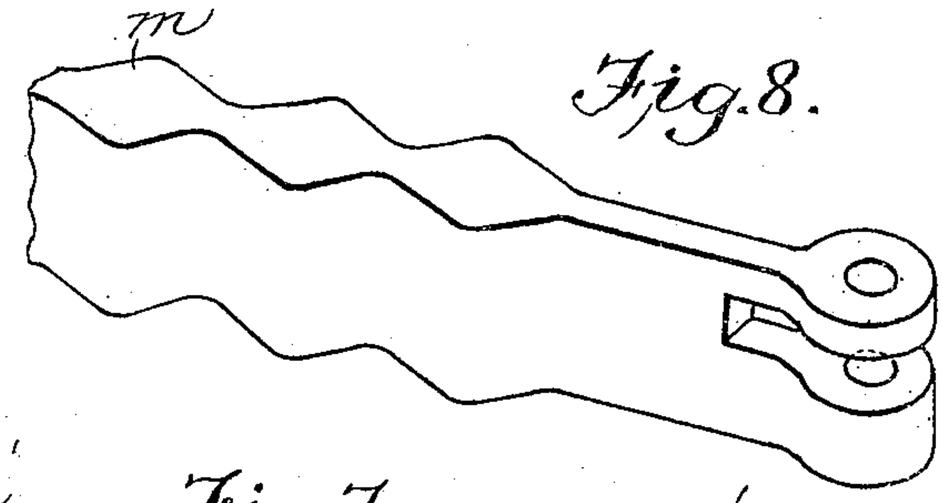


Fig. 6.

Fig. 8.



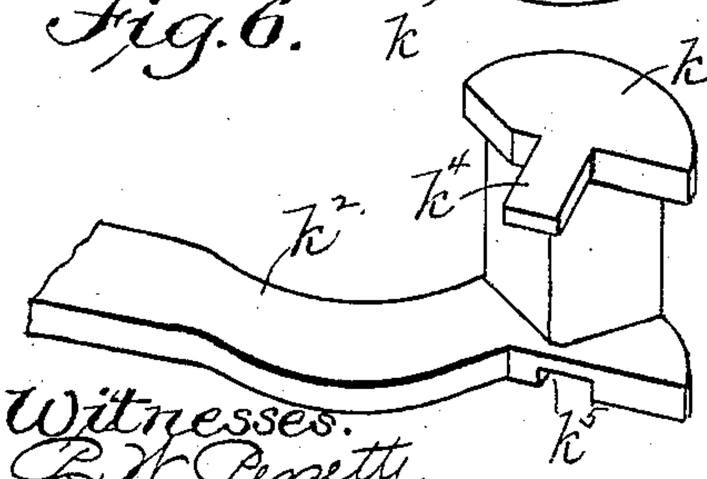
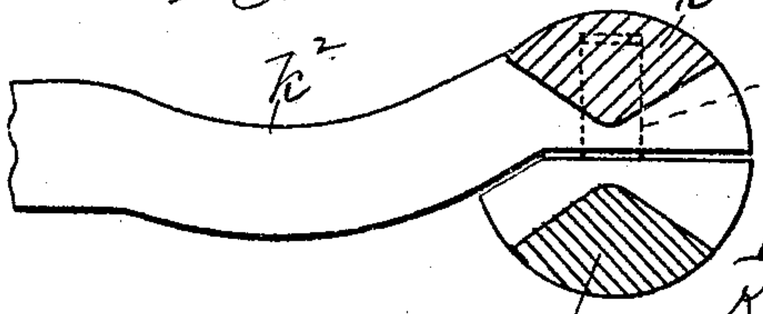


Fig. 7.



Witnesses.
L. H. Pezzetti
E. Batchelder

Inventor.
Kennedy Park
by Wright Brown Quinby & Otty.
Attys.

UNITED STATES PATENT OFFICE.

KENNEDY PARK, OF MANSFIELD, OHIO.

APPARATUS FOR FORMING SERPENTINE HOLLOW BODIES.

No. 808,943. Specification of Letters Patent. Patented Jan. 2, 1906.

Application filed March 20, 1905. Serial No. 250,953.

To all whom it may concern:

Be it known that I, KENNEDY PARK, of Mansfield, in the county of Richland and State of Ohio, have invented certain new and useful Improvements in Apparatus for Forming Serpentine Hollow Bodies, of which the following is a specification.

This invention relates to the manufacture of serpentine headers which are rectangular in cross-section and flat on two opposite sides, the other two sides being serpentine. Headers of this class are used in sectional steam-boilers, wherein the serpentine sides are nested together.

The invention has especial relation to the type of apparatus for this purpose shown in Letters Patent of the United States, No. 727,830, granted to me May 12, 1903, the essential features of said apparatus being oscillatory or rotary dies adapted to externally form a serpentine hollow body and a comformable flowing support for the interior of said body, said support being such as a mass of metal pellets confined in the hollow body.

The present invention consists mainly in the substitution for the said conformable flowing support of an oscillatory automatically expanding and contracting support for the interior of the hollow body, said support being of an unyielding positively-acting nature and comprising in its preferred embodiment an expansible and contractible mandrel adapted to occupy the interior of the hollow body between the dies and means for intermittently and positively expanding the material and causing its sides to follow the undulations of the dies and coöperate therewith in forming the serpentine sides of the hollow body.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a top plan view of an apparatus embodying my invention. Fig. 2 represents a section on line 2 2 of Fig. 1. Fig. 3 represents a section on line 3 3 of Fig. 2. Fig. 4 represents a view similar to Fig. 3 with the parts in different positions. Fig. 5 represents a perspective view of the acting portion of the expansible mandrel. Fig. 6 represents a perspective view of one of the sections of the mandrel. Fig. 7 represents a sectional view of the mandrel. Fig. 8 represents a perspective view of the mandrel expanding and contracting device. Fig. 9 represents a section on line 9 9 of Fig. 3. Fig. 10 represents a section on line 10 10 of Fig. 4. Fig. 11 is a detail plan view representing a modified construction of the filling-piece hereinafter described.

The same reference characters indicate the same parts in all the figures.

In the drawings, *a a* represent die-carriers, which are mounted to rotate or oscillate on fixed centers *b b*. Each die-carrier has a serpentine die-face *c*, adapted to act progressively in forming serpentine sides 2 2 on the serpentine header 3, said serpentine dies being preferably segmental and occupying portions of the peripheries of the die-carriers. The die-carriers are provided with side dies c^3 c^3, located at opposite sides of the serpentine dies and formed as flanges projecting outwardly from the die-carrier and from the dies *c*. Means are provided for moving the dies *c* in unison, said means being preferably the same as shown in my former patent—namely, a hydraulic ram the piston *h* of which is connected by its rod *h'* with a crosshead *i*, the latter being connected by rods *j j* with the die-carriers.

The construction thus far described is or may be the same as the corresponding parts shown in my former patent.

In carrying out my invention I provide as the means for internally supporting the header-blank 1 a sectional mandrel the acting portion of which is composed of two parts or sections *k k'*, which are formed on or affixed to the ends of swinging arms k^2 k^2, mounted to oscillate upon a common pivot stud or pin k^3, affixed to the base of the machine. Each of the sections *k k'* has a convex outer face adapted to conform to the concavities of the serpentine dies *c*. The pivotal connection between the mandrel-sections and the supporting-frame enables the mandrel as a whole to be oscillated, so that one section can enter a concavity of one of the serpentine dies, while the other section coincides with a convex portion of the opposite die, as shown in Fig. 4, the arrangement being such that each section of the mandrel coincides alternately with a convex and a concave portion of the adjacent serpentine die *c*. Means are provided for intermittently and positively expanding the mandrel and permitting its contraction to vary the width of the mandrel and to cause the projection of either section of the mandrel into a concavity of the adjacent serpentine die when the other section is supported by a convex portion of the opposite die. In this embodi-

ment of my invention I have shown as the mandrel expanding and contracting means a filling-piece *m*, interposed between the two sections of the mandrel and having alternating recesses and projections in its sides, the said filling-piece being connected by a rod *n* with the cross-head *i*, so that it is moved by said cross-head and simultaneously with the dies. The projections and recesses of the filling-piece are so formed and timed that when one of the sections of the mandrel is supported by a projecting portion of one of the serpentine dies the other section is forced by the filling-piece into the coinciding recess of the opposite die, as shown in Fig. 4. In this figure the section *k* is shown as supported by a projecting portion of one of the dies, while the section *k'* is shown as entering a recess in the opposite die. The rotation of the dies in the direction indicated by the arrows in Fig. 4 will next cause the section *k* to be supported by a projection of the adjacent die, while the section *k'* enters a recess at the opposite side. It will be seen, therefore, that the mandrel as a whole oscillates between the dies and that it is oscillated by the serpentine dies, so that it causes the sides of the blank interposed between the mandrel and the serpentine portions of the dies to assume the curvature provided for by the serpentine dies and the acting faces of the mandrel-sections.

It will be seen that the automatically expanding and contracting oscillatory mandrel above described coöperates with the rotary dies in such manner as to impart a serpentine form to opposite sides of the blank 1, the other two sides of the blank being retained in a flat form by the dies c^3 c^3. The filling-piece *m* may be composed of sections, (see Fig. 11,) which are provided with ears connected by hinges or pivots *r* to make the filling-piece flexible, and thus prevent its rear portion from binding on the inner walls of the blank in case the length of the blank and of the filling-piece is such as to involve a swinging movement of the rear end of the filling-piece through an arc of greater length than the distance between the sides of the blank.

Each of the sections *k k'* is preferably provided with a tongue k^4, which is movable in a recess k^5 in the other section, said tongues and recesses being adapted to keep the sections in their proper relative positions.

I claim—

1. An apparatus of the character stated, comprising rotary or oscillatory dies adapted to externally form a serpentine hollow body, an oscillatory, expansible and contractible support for the interior of said body, and means for intermittently and positively expanding said support.

2. An apparatus of the character stated, comprising rotary or oscillatory dies adapted to externally form a serpentine hollow body, an expansible oscillatory mandrel adapted to occupy the interior of a hollow body between said dies, means for moving the dies in unison, and means for intermittently and positively expanding the mandrel.

3. An apparatus of the character stated, comprising rotary or oscillatory dies adapted to externally form a serpentine hollow body, a mandrel composed of separable sections each hinged to a fixed support, an expanding and contracting device interposed between said sections, and means for moving said device and the dies simultaneously.

4. An apparatus of the character stated, comprising rotary or oscillatory dies adapted to externally form a serpentine hollow body, a mandrel composed of separable sections each hinged to a fixed support, a filling-piece interposed between said sections, said filling-piece having alternating projections and recesses, and means for simultaneously moving the dies and filling-piece.

In testimony whereof I have affixed my signature in presence of two witnesses.

KENNEDY PARK.

Witnesses:
C. F. BROWN,
E. BATCHELDER.