(No Model.) 3 Sheets—Sheet 1.

F. A. ELLIS.

MEANS FOR MAKING CYCLE FRAMES.

No. 604,490. Patented May 24, 1898.

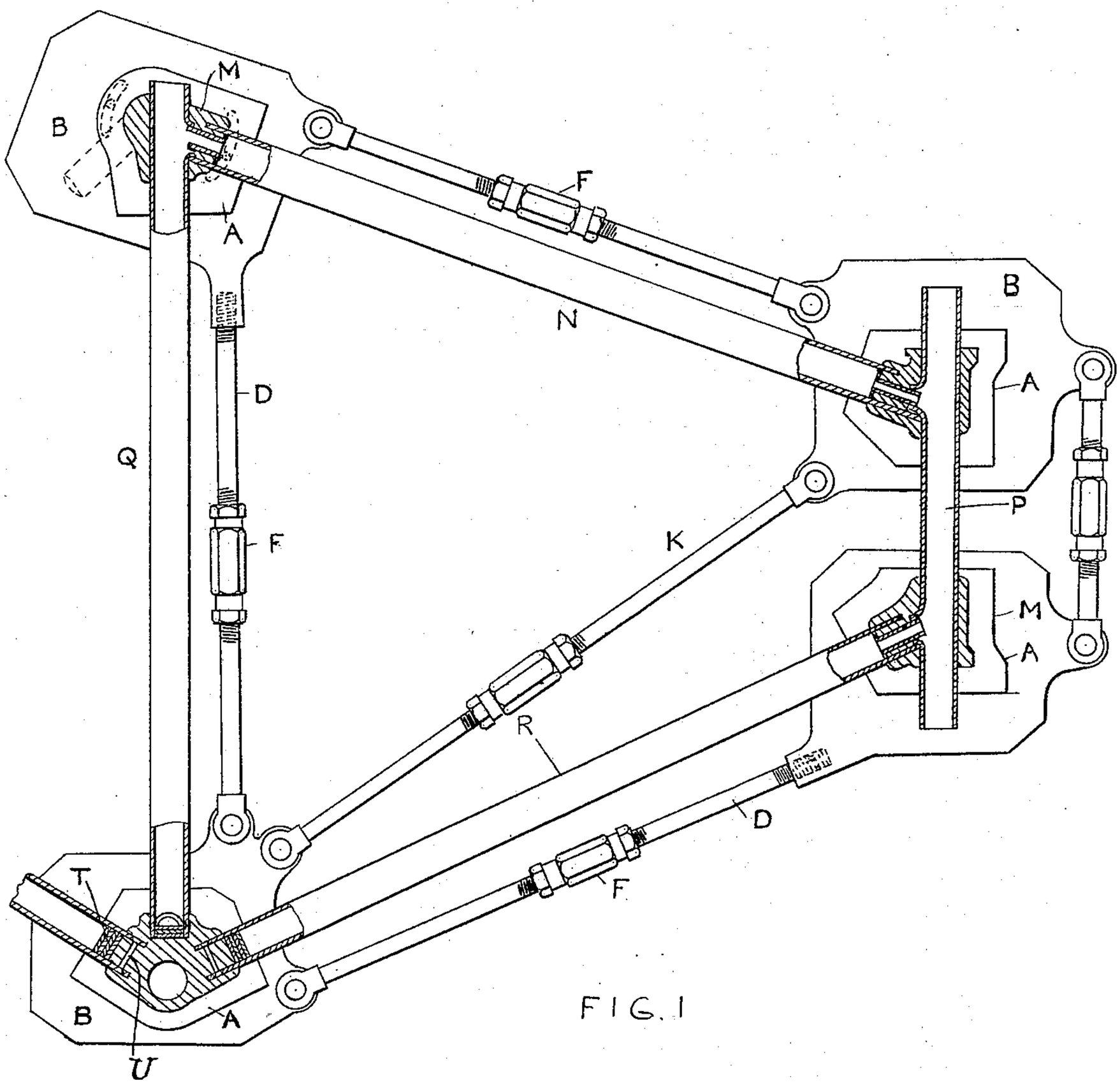

FIG. 1

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(No Model.) 3 Sheets—Sheet 2.

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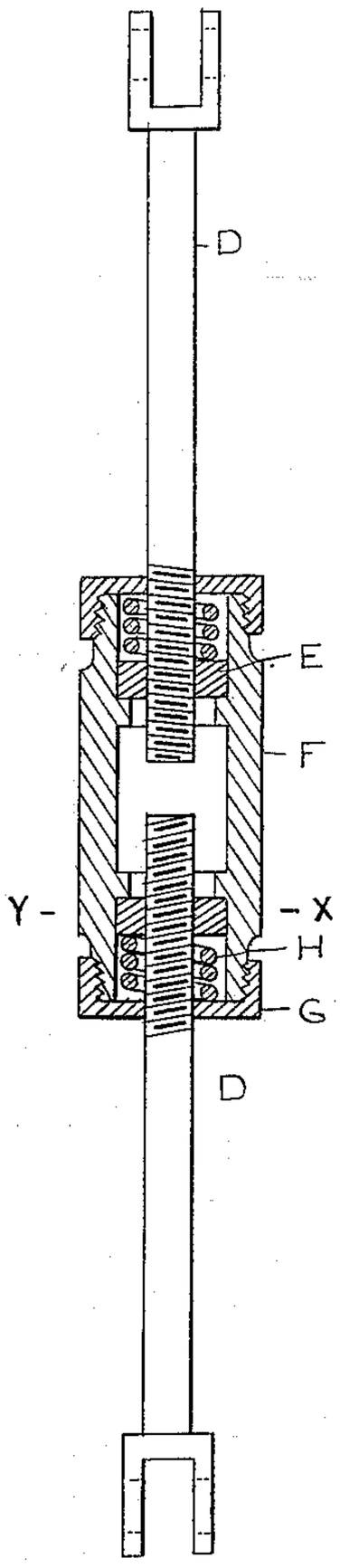

FIG. 2

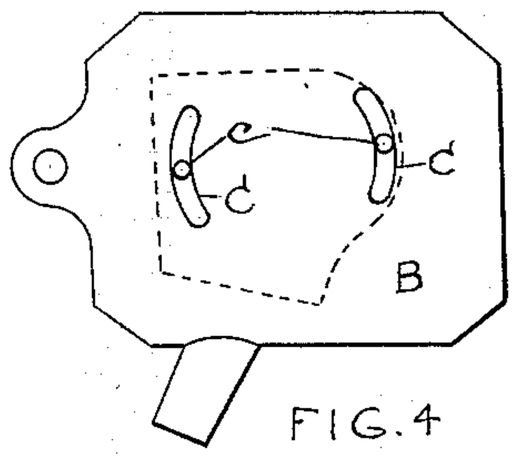

FIG. 4

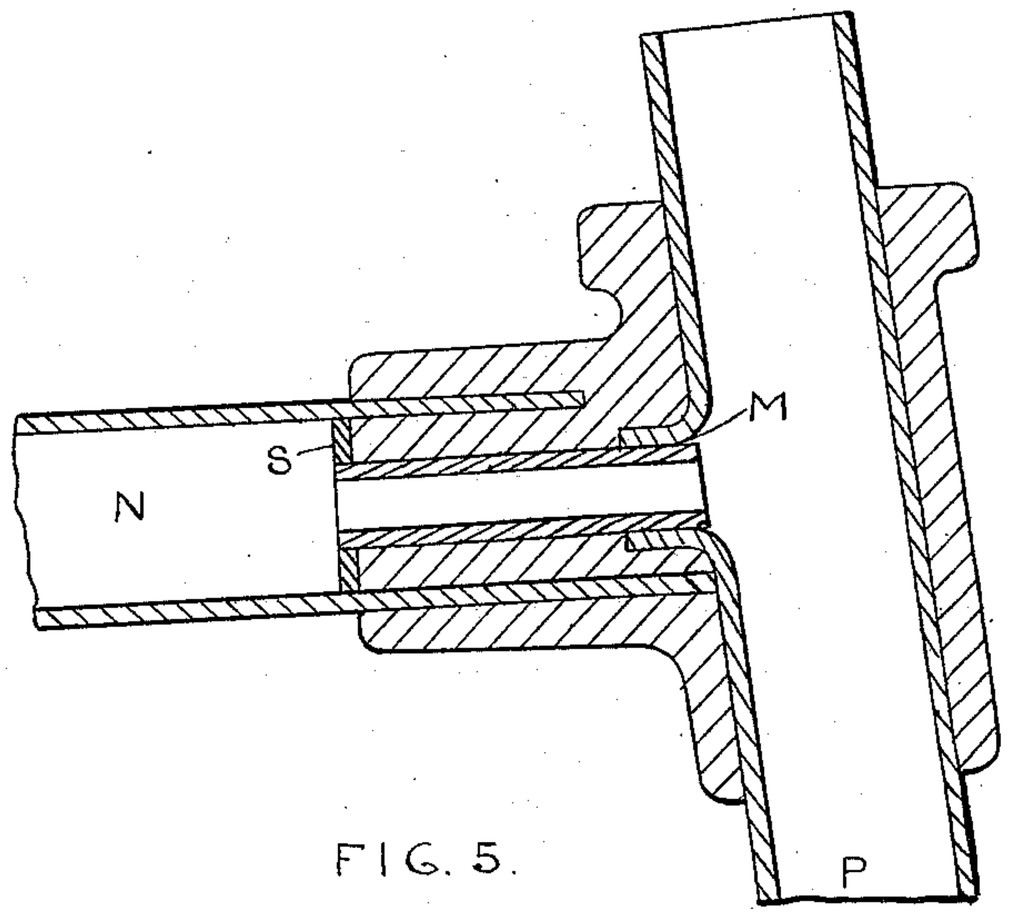

FIG. 5.

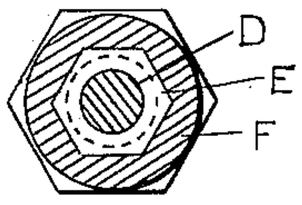

FIG. 3

Witnesses
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3 Sheets—Sheet 3.

F. A. ELLIS.

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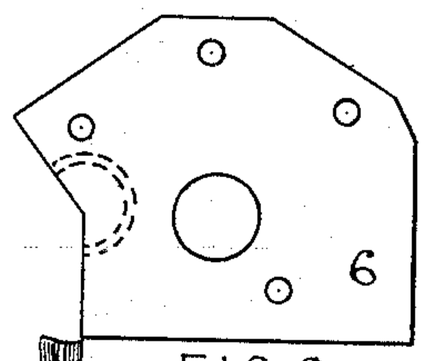

FIG. 8

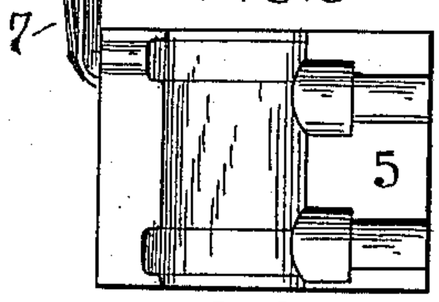

FIG. 9

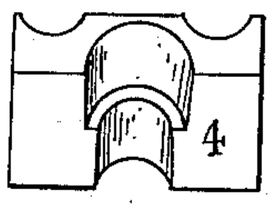

FIG. 10

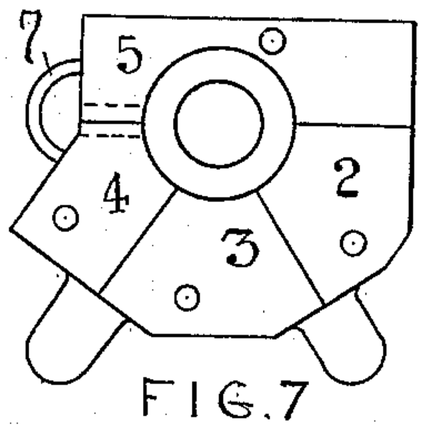

FIG. 7

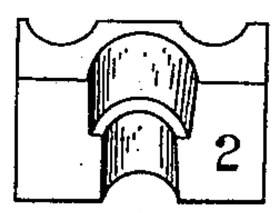

FIG. 11

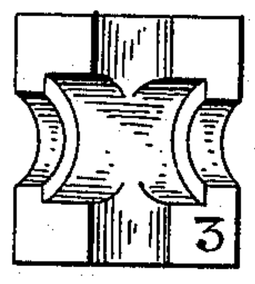

FIG. 12

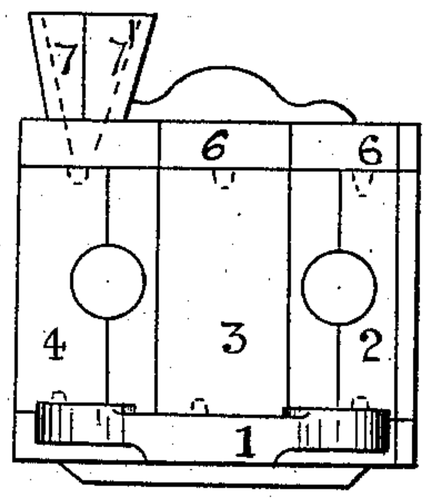

FIG. 6

WITNESS:

Annie R. Isaac.

Otto Munn

INVENTOR

Frederick Arthur Ellis

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Attys

UNITED STATES PATENT OFFICE.

FREDERICK ARTHUR ELLIS, OF LONDON, ENGLAND.

MEANS FOR MAKING CYCLE-FRAMES.

SPECIFICATION forming part of Letters Patent No. 604,490, dated May 24, 1898.

Application filed July 13, 1896. Serial No. 599,031. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK ARTHUR ELLIS, residing at London, England, have invented Improvements in Means for Making Cycle-Frames, of which the following is a specification.

This invention relates to the construction of cycle-frames in aluminium alloy and to means used therein by which hard-drawn tubes of aluminium alloy may be connected to form the main members of the frame by aluminium cast sockets; and it consists of improvements in the manufacture of the same, in jig-frames connecting the metal molds, in the arrangement of the tubes to one another to insure sound castings in the metal chill-molds, and in effecting firm attachment between the said cast sockets and tubes by mechanical locking and by the preparation of the tube ends with an aluminium braze before casting.

Aluminium alloy has long been known as a metal giving high strength when worked, while at the same time being of light weight, and therefore eminently adapted to cycle-frames; but owing to the difficulty found in uniting parts homogeneously and reliably by soldering, brazing, or attachment by casting it has been the practice either to unite the joints of such parts by various modes of screwing, in an expensive manner and with little strength, or, on the other hand, to cast the whole frame, the resulting product of which is obviously much heavier and without the strength and elasticity of metal which has been wrought or worked, as in drawn tubes.

A serious difficulty encountered in the production of cast sockets of aluminium about hollow tubes, particularly in metal molds, is that when the tubular members are closed at one end by the castings the great expansion of the internal volume of air in the tubes by the heat of the casting causes an irruption of air through the molten socket while being cast, and thus tends to make it unsound. Another serious difficulty in the manufacture of aluminium is to insure a homogeneous metallic fusion or attachment between the said sockets and tubes, so that they will not become loose and detached under shock, jar, or the effect of the weather, much deterioration usually taking place in ordinary brazed or other joints where dissimilar metals are employed. To overcome these difficulties, I give absolute ventilation of the interior of the tubes to the outer atmosphere and I employ a special aluminium braze, as fully described in a sister application, Serial No. 599,018, dated July 13, 1896, and prepare the ends of the tubular members therewith as follows:

Before running the cast sockets about the ends of the tubes I prepare the latter by raising the ends of the tubes nearly to their temperature of surface melting, taking care not to exceed such a point, and I then apply an aluminium braze consisting as to five-sixths of its weight of aluminium and tin in the proportion of their combining equivalents—viz., as 27.4 of aluminium to one hundred and eighteen of tin—and the remaining one-sixth is made up of variable proportions of copper and spelter. I melt the braze upon the surface of the tubes and work it in well, care being taken to remove all surface oxidations and impurities. The ends of the tubes so prepared are ready to receive the cast sockets, and the temperature of the molten metal is just sufficient to melt the braze and produce homogeneous joints between the sockets and tubes.

In order that my invention may be the better understood, I now proceed to describe the same, reference being had to the drawings hereto annexed and to the letters and figures marked thereon.

Figure 1 is a plan of a set of adjustable chill-molds adapted to carry out the casting of joint-sockets about the tubular members of an aluminium cycle-frame, showing the cycle-frame and cast sockets therein in section. Fig. 2 is an enlarged section of the adjustable tension-rods between chill-plates. Fig. 3 is a cross-section on X Y of the same. Fig. 4 is an under detached view of a mold-plate, and Fig. 5 is an enlarged section of a cast socket and the tube ends cast therein, with special ventilation attachments between the tubes to allow egress of expanded air from the interior of tubes to atmosphere. Fig. 6 is an outside elevation of sectional metal chill-mold in which one joint of the frame is cast. Fig. 7 is a plan of the same with the top plate removed. Fig. 8 is an un-

der view of the top plate. Figs. 9, 10, 11, and 12 are views of the various sections detached and displayed as to their interior faces.

Solid drawn tubes of aluminium having been prepared of the requisite length to make up a desired cycle-frame and having their ends prepared by the application thereto of an aluminium braze or solder, as hereinabove described, are laid with their ends in the said molds A A, which are preferably made in copper as chill-molds, provided with the usual ventilation-holes and with a runner giving a head of metal and divided into halves and sections, as is usual in chill-molds, fitting together by steady-pins or dowels and finally clamped together. The chill or metal molds are made in sections held together by dowel-pins and so divided into sections that they can be removed easily from the sockets when cast. In Figs. 6 to 12 I show one of such molds divided into six sections. 1 is a bottom plate. 2, 3, 4, and 5 are divided sections built up on same and forming within them the mold for the socket, and 6 is the top plate holding the said side sections together by dowel-pins and recesses. 7 7′ is the runner or geat, halved between the sections 5 and 6, into which the molten alloy is poured, having a considerable head. The ends of the tubes are supported in the molds by fitting the apertures of said molds. The lower half of the chill-mold is fixed to the jig-plates B conveniently by bolts *c* passing through radial slots C in the lower plate to allow of angular adjustment of the chills to the supporting-plates.

The jig-plates B are connected to one another by tension-rods D, each of which is divided and provided with right and left handed threads engaging with nuts E E, inclosed in a case F and turning therewith, the case F being externally hexagonal or otherwise flat-faced, so as to be adapted to turn with a spanner.

Between the ends of the nuts E and the caps G of the external case F are placed strong springs H, which will allow the chill-molds A and plates B to move slightly relatively to one another after the tension-rods D are set for casting the socket-joints should there be expansion in the tubes.

When the tension-rods between molds are adjusted to the required length, a diagonal bracing-rod K being also used to fix the relative angular position of the members of the frame, an aluminium alloy is run into the closed molds A by a runner giving a head to the metal, and the sockets of the tubular frame are cast *in situ* and adhere or homogeneously unite with the metal of the tubes by reason of the prior preparation of the ends of the tubes by an aluminium braze, as above described.

To prevent the blowing of air from the expanded contents of the tubes through the molten metal, I pierce a hole M, Fig. 5, in one tube P exactly opposite to the point where the adjoining tube N abuts upon it. I draw the lips of the orifice M so as to form a hole for the reception of a tube and washer S, thus giving access from the interior of one tube to the other. This I do between tubes P and N, as described, and between tubes Q and N and R and P, the outer ends of P and Q passing outside the chill-molds to the outer atmosphere. In the lower socket I show asbestos waddings T T inserted in the ends of the tubes to stop the flow of molten metal into the tubes. I show also pins U U riveted into and across the ends of the tubes, the asbestos washer T being set far enough back to allow the molten metal of the socket to enter the end of the tube far enough to envelop the pin U, which thus makes a fair mechanical lock between the tube and the socket.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed, I declare that what I claim is—

1. In combination, the tubular frame members arranged to form a closed figure, the molds at the meeting points of said members, one or more of said members extending through its mold and opening into the outer air, and the washer-and-tube connection for placing the interior of the tubular members in communication, said connection being adapted to permit and limit the flow of the molten metal within and about the tubular members at the joint, substantially as described.

2. In combination, the series of molds adapted to cast sockets about the meeting ends of tubular frame members which are arranged to form a closed figure, and the adjustable rods connecting the molds, said rods having yielding portions to allow for the expansion and contraction of the tubes while the sockets are being cast, substantially as described.

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

FREDERICK ARTHUR ELLIS.

Witnesses:
RICHARD A. HOFFMANN,
CHARLES H. CARTER.