(No Model.) 2 Sheets—Sheet 1.

F. H. DANIELS.

MECHANISM FOR PRODUCING INGOTS, BARS, &c., FROM FLUID METAL.

No. 368,817. Patented Aug. 23, 1887.

FIG. 1

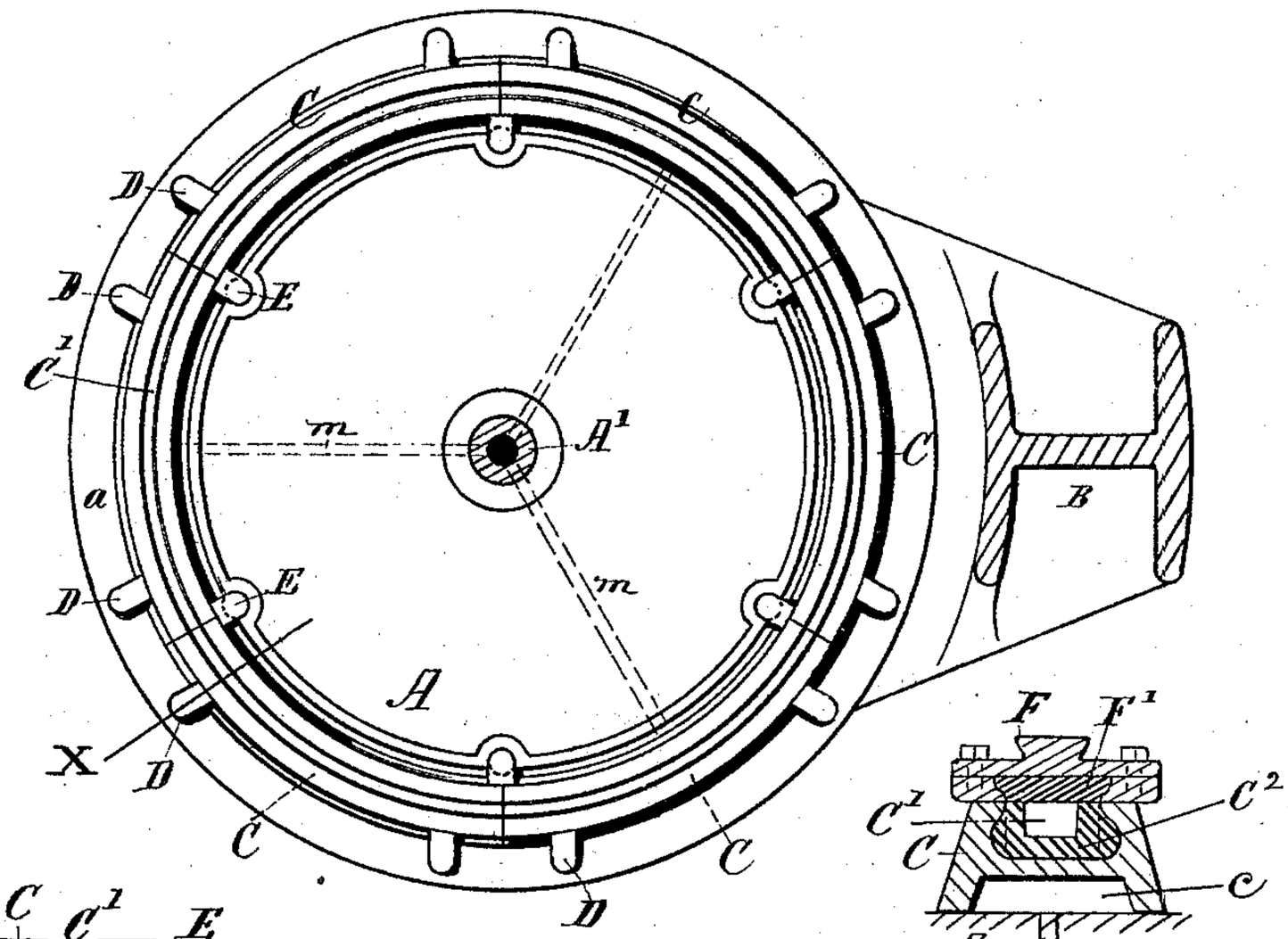

FIG. 3a

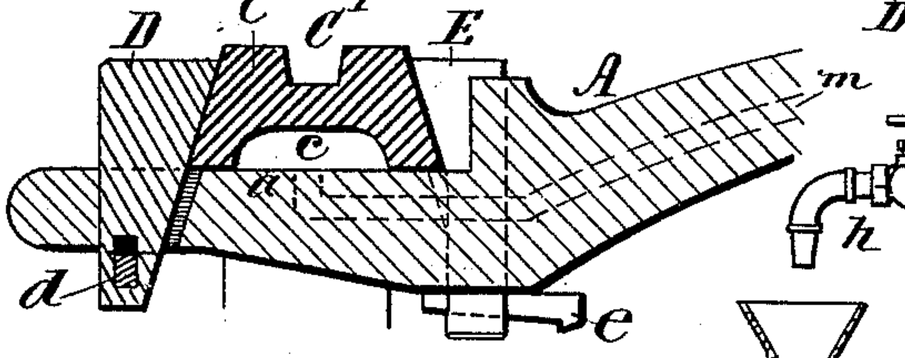

FIG. 3

FIG. 2

WITNESSES.

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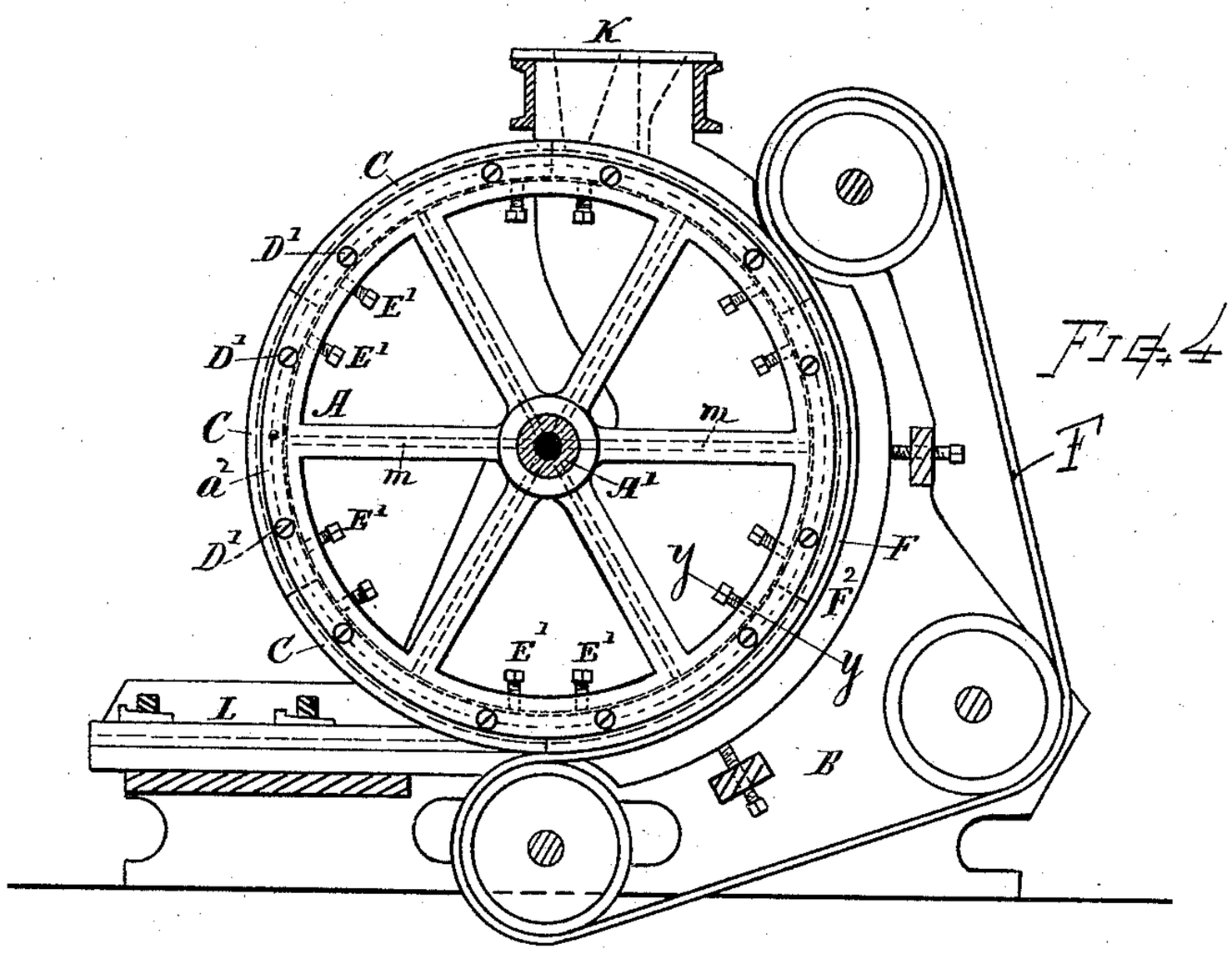

FIG. 4

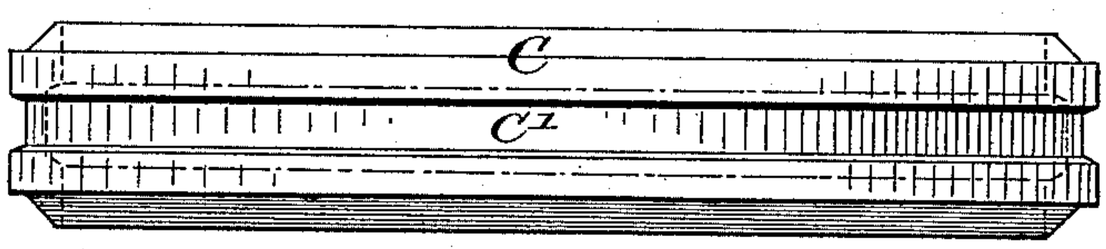

FIG. 5

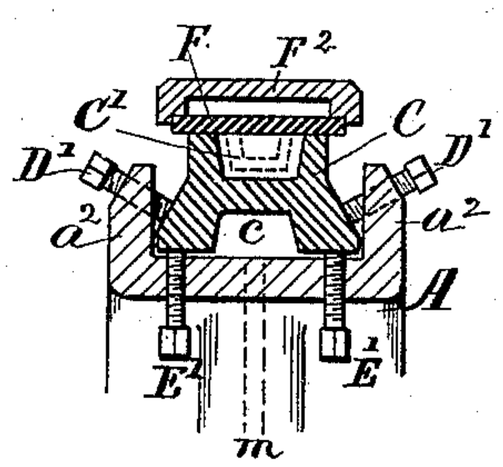

FIG. 6

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UNITED STATES PATENT OFFICE.

FRED H. DANIELS, OF WORCESTER, MASSACHUSETTS.

MECHANISM FOR PRODUCING INGOTS, BARS, &c., FROM FLUID METAL.

SPECIFICATION forming part of Letters Patent No. 368,817, dated August 23, 1887.

Application filed April 27, 1887. Serial No. 236,285. (No model.)

To all whom it may concern:

Be it known that I, FRED H. DANIELS, a citizen of the United States, residing at Worcester, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Mechanism for Producing Ingots, Bars, or Rods from Fluid Metal, of which the following, together with the accompanying drawings, is a specification sufficiently full, clear, and exact to enable persons skilled in the art to which this invention appertains to make and use the same.

My present invention relates to certain improvements in machinery for forming ingots, bars, or rods from molten or fluid metal, applicable to that class of mechanism which is set forth in my previous Letters Patent Nos. 359,348 and 359,349, wherein a continuous ingot-forming mold is employed in connection with a rotatable wheel or carrier.

This invention, while not limited to the working of any particular variety of fluid or molten metal, is herein illustrated and described with more especial reference to the working of molten steel or iron in the production of ingots, bars, or rods, such as employed in the manufacture of wire rods, hoop-iron, and other shapes, or similarly-produced product.

The object of my present invention is to provide a circular mold composed of interchangeable segmental sections, which can be readily attached to or removed from the carrier-wheel, as desired, for changing the sizes or forms of ingots that can be made, and for facilitating repairs or renewal of the molds when worn out or injured, thus adapting a single machine or carrier for a variety of work, and for maintenance at comparatively small expense.

Another object is to provide, in combination with the carrier-wheel and circular mold, formed of segmental sections, devices, as hereinafter explained, for securing the mold-sections in position upon the carrier-wheel in a manner which will permit of their being readily removed and replaced, and also afford facilities for the proper adjustment and alignment of the mold-sections to the required position for giving a continuous annular groove or matrix.

These objects I attain by mechanism the nature of which is set forth in the following description, the particular subject-matter claimed being hereinafter definitely specified.

In the drawings, Figure 1 is a plan view of certain parts of a machine for forming ingots, bars, or rods from fluid metal, illustrating my invention as applied to an ingot-mill wherein the mold is on the side of the supporting-wheel, which is revoluble about an upright axis, the top of the mechanism being removed to show the mold. Fig. 2 is a vertical central section of the mechanism as thus adapted for rotation on an upright axis. Fig. 3 is a section of the supporting and detachable mold-sections at the line X, Fig. 1, (drawn to somewhat larger scale,) and showing the preferred means of securing the mold-sections to the rim. Fig. 3ª is a vertical section of the mold and its cover, showing said parts provided with a refractory lining. Fig. 4 is a vertical sectional elevation, illustrating my invention as adapted for an ingot-forming mill, in which the supporting-wheel is revoluble on a horizontal axis and the mold is on the face of the rim. Fig. 5 is a face view of one of the mold segments or sections. Fig. 6 is a transverse section at line *y y*, Fig. 4.

In reference to parts, A denotes the matrix wheel or carrier, and A′ its central shaft or axis, which is supported in suitable bearings, *b*, on the frame B. Said wheel or its shaft is connected with suitable driving mechanism, so as to be rotated at the required degree of speed for advancing the continuous mold as fast as the fluid metal is supplied thereto and the produced ingots or bars removed therefrom, to render the operation and product continuous.

The rim of the wheel A is dressed off to give a seating-surface, *a*, which may be on the face or side of said wheel, accordingly as the mold is to be applied thereto, or the wheel disposed to revolve in horizontal or upright position.

In my present improvement the circle or continuous mold in which is formed the matrix or groove C′, within which the metal is to be poured and retained until congealed or solidified, is composed of a series of independently detachable or interchangeable sections or segments, C, each provided with a part of the matrix-groove, and which, when fitted to-

gether, form a complete circle, giving the continuous annular matrix C′ about the wheel. The ends of the respective sections are fitted to abut or match closely against each other when placed together on the wheel, and are retained in position by suitable fastening devices.

In the adaptation shown in Figs. 1, 2, and 3 the edges of the mold-sections are beveled, and they are held in place upon the wheel by dogs or wedge-shaped studs D and E, which pass down through the wheel, and which are retained and drawn down for tightening them by means of keys *d* and *e*, that pass through openings in the lower ends of the studs in the manner indicated. The studs E are disposed within the circle and bevel outwardly and the studs D are outside the circle and bevel inwardly, and they act in opposition to each other for pressing against the sides or beveled surfaces and forcing the mold sidewise, accordingly as one or the other is driven or drawn down to a greater or less degree; hence by means of the beveled surfaces the mold-sections can be adjusted as well as retained in position, and the mold-sections can be very quickly and easily removed independently of each other by simply driving out the keys *d* from the studs D and then driving the studs from the wheel. The mold can thus be changed for different shapes and larger or smaller sizes, or any single section can be taken out and replaced for repairs or renewal.

In the under side of the mold I form a space or cavity, as at *c*, into which to flow water for keeping the mold cool. The water is conducted to the cavity *c* through passages *m* in the carrier A, it being introduced from a suitable supply-pipe, *h*, through the hollow central shaft, A′. The water thus presented flows upward into the cavity *c* and against the under surface of the mold and passes out at the crevices between the mold and the seating-surface, thus cooling the portion of the mold which is most severely heated. The rim of the carrier is also cooled without the water flowing into the groove or matrix C′ to that extent which occurs when the water is poured directly onto the top of the mold.

The cover or outer portion, F, of the mold is arranged substantially in the manner described in my former patent before referred to, and as the arrangement thereof is not a part of my present improvement it need not therefore be herein particularly described.

The mold-sections C are made of cast-iron, or preferably of some refractory material—as graphite, fire-clay, or similar substances such as are used in the construction of crucibles. They can be made solid, or may be externally of metal and lined with refractory material on the matrix-surfaces, as indicated in Fig. 3ª, which shows a mold-section C provided with a lining, C^2, of refractory material. The cover F also has a refractory lining, F′. These refractory linings can be secured in place within the mold section or body and the covering part by under locking-bevels at the sides or in other suitable manner; or, if preferred, the linings can be made with square edges, so that they can be easily removed and replaced, as desired.

The holding devices or locking-dogs for securing the mold-sections C upon the supporting-wheel A may be made in other form from that shown, in lieu of the beveled studs D and E for effecting equivalent results in the adjustment and securing the mold-sections in place.

In Figs. 4, 5, and 6 of the drawings I have illustrated my invention as applied to the peripheral face of the supporting-wheel, the sections being made as segments of a circle with the groove C′ on the exterior face thereof. The wheel is provided on the rim with flanges a^2, through which flanges are arranged screws D′, that clamp the sections in position, while other set-screws, E′, are arranged radially through the rim, the ends of which screws E′ press outward against the inner surfaces of the sections and facilitate the adjustment of the same to proper position and cylindrical alignment. In this instance the outer part of the mold or cover of the matrix is formed as an endless traveling belt, and provided with the water-back F^2, for supporting it against the periphery of the mold C, in the manner described in my former Letters Patent No. 359,348.

K indicates the funnels or receiver into which the molten metal is poured in fluid condition, and L indicates the guide through which the formed ingot, bar, or rod is discharged from the matrix, the general operation of the machine being substantially as heretofore described in my patent last above referred to.

In Fig. 6 I have indicated different sizes of the groove or forming-matrix by dotted lines. Any desired shape and size may be employed, and any change from one size or shape to another can be effected in a ready and convenient manner by the interchange of the segments or mold-sections of the wheel, which can be taken off one at a time by loosening the clamping-screws D′.

In the present instance I have shown the continuous mold formed of six removable sections C; but I do not confine myself to this exact number, as a greater or less number of such mold-sections could be employed, as most convenient in any instance, without departing from the nature of my invention.

I am aware that molds for receiving fluid metal in the process of casting ingots have heretofore been employed in combination with traveling belts or chain carriers, and that in such mechanism the molds have been formed separate or in link-sections, to permit the belt or chain to work about the guiding and operating sprocket-wheels. I do not, therefore, desire to include such construction, broadly, as a feature of my invention.

What I claim as of my invention, and desire to secure by Letters Patent, is—

1. In a mechanism for forming ingots or bars from fluid metal by continuous process, the

combination of the revoluble carrier-wheel and a series of removable segmental mold-sections, the ends of which abut and match against each other, said sections together forming a complete circular matrix and adapted for interchanging for different sizes of matrix and for renewal in case of wear, substantially as set forth.

2. The mold-section C, for ingot-forming mills, formed as a circular segment having the matrix-groove C′ along its upper side and a cavity or water-space, *c*, formed therein along its under side, substantially as set forth.

3. The combination, with a supporting-carrier, of removable mold-sections composing the continuous matrix, and having a water-space formed therein, substantially as and for the purpose set forth.

4. The combination, with the revoluble carrier-wheel A, having the seating-surface *a*, of the continuous annular mold composed of a series of segmental sections, C, and attaching devices adapted for confining the mold-sections upon the carrier-wheel and for separately adjusting said sections to proper alignment with each other, in the manner substantially as hereinbefore set forth.

5. The combination, with the revoluble carrier-wheel A, having the seating-surface *a*, of the upwardly-beveled segmental mold-sections supported thereon, the fastening-studs E, having an outwardly-inclined side, and the fastening-studs D, having an inwardly-inclined side, fitted in the rim of the carrier-wheel, and said studs oppositely embracing the beveled sides of said mold-sections, and means for adjusting or drawing down said studs within the rim to a greater or less extent, substantially as and for the purpose set forth.

6. In mechanism for forming ingots, bars, or rods from fluid metal, the combination of the detachable mold-sections having a water space or cavity, as set forth, and the mold-supporting carrier provided with passages disposed to deliver the water through the body of the carrier into said cavity of the mold, substantially as and for the purpose set forth.

Witness my hand this 22d day of April, A. D. 1887.

FRED H. DANIELS.

Witnesses:
CHAS. H. BURLEIGH,
ELLA P. BLENUS.