

No. 629,591.

Patented July 25, 1899.

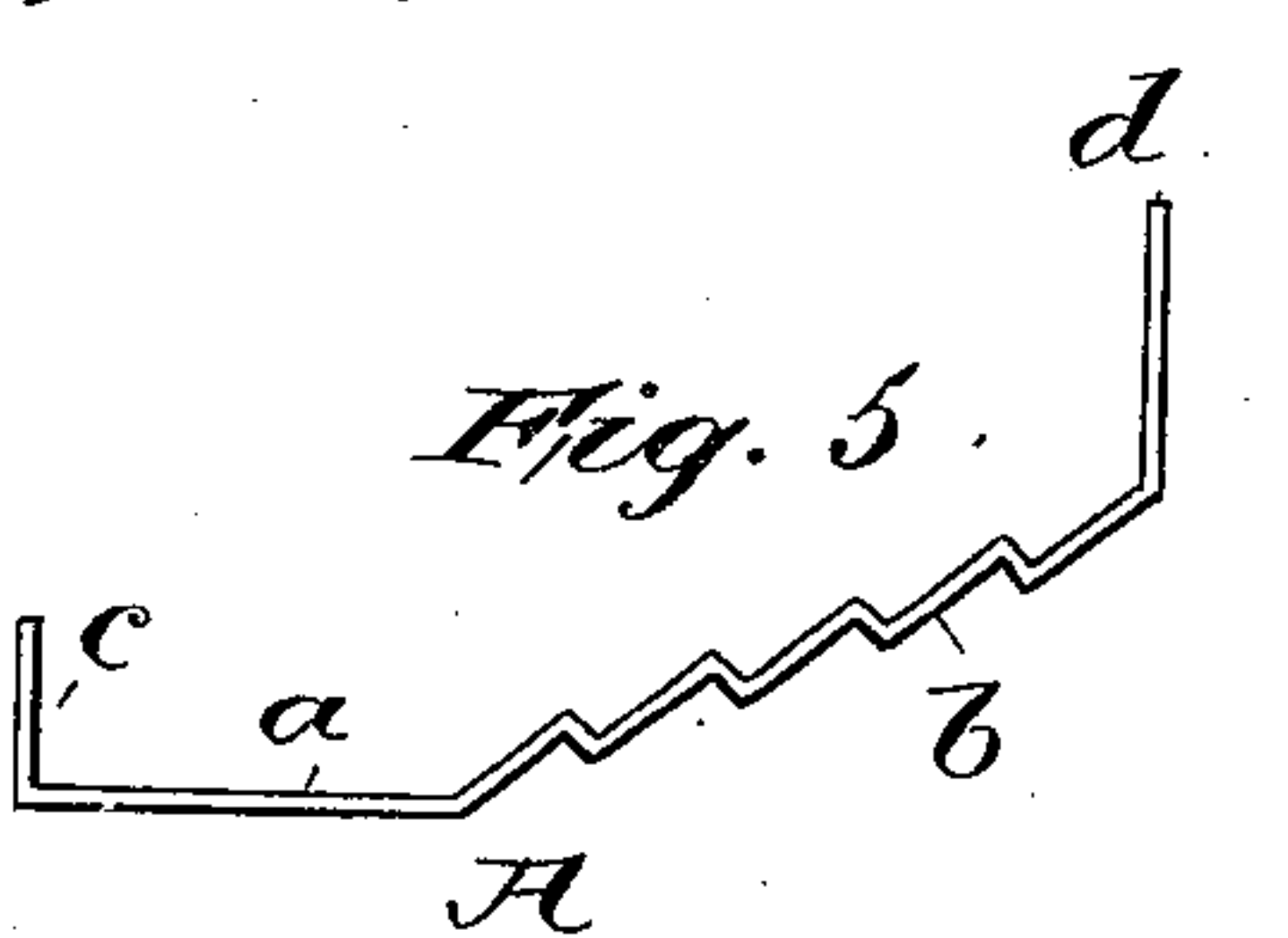
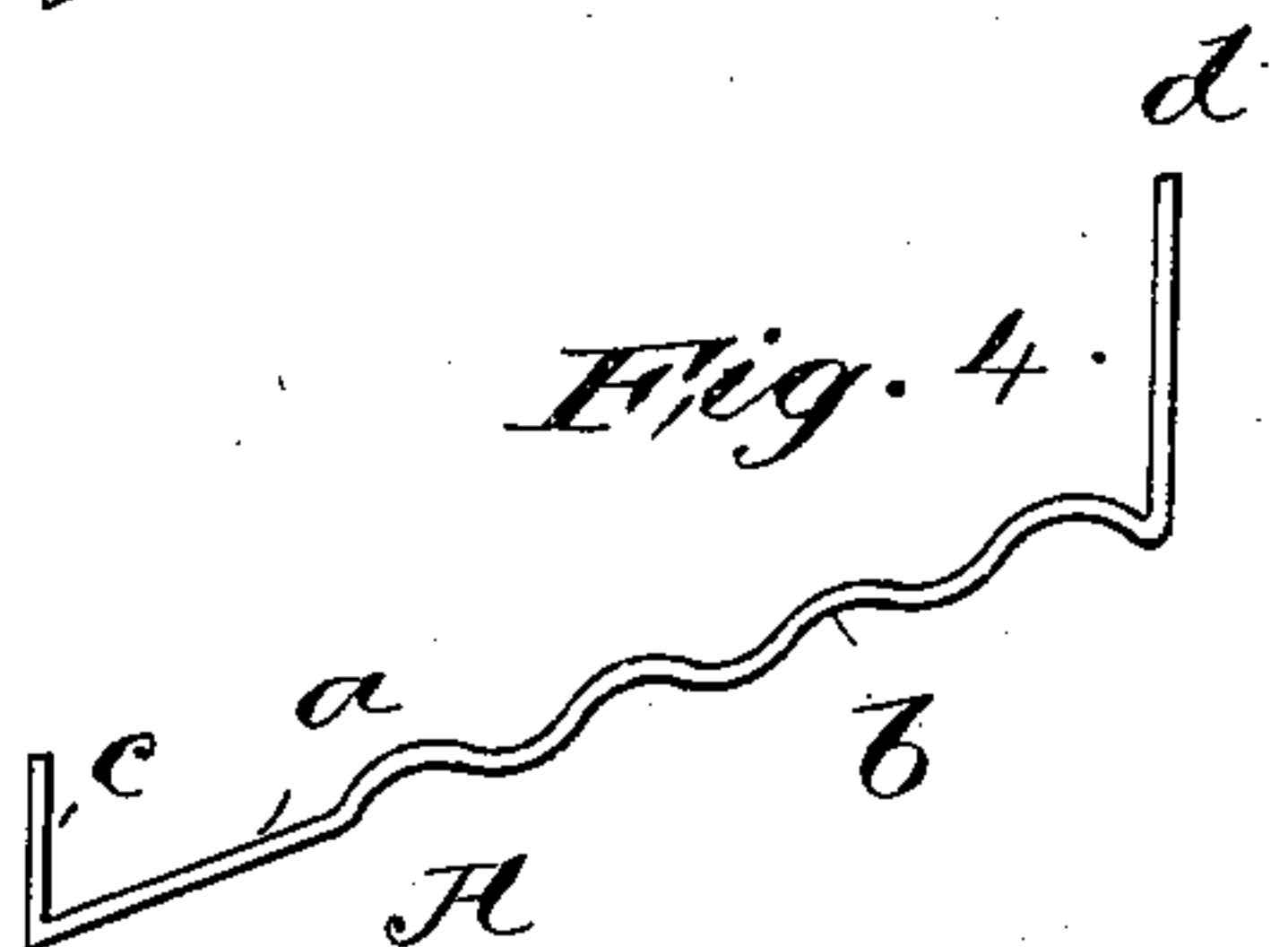
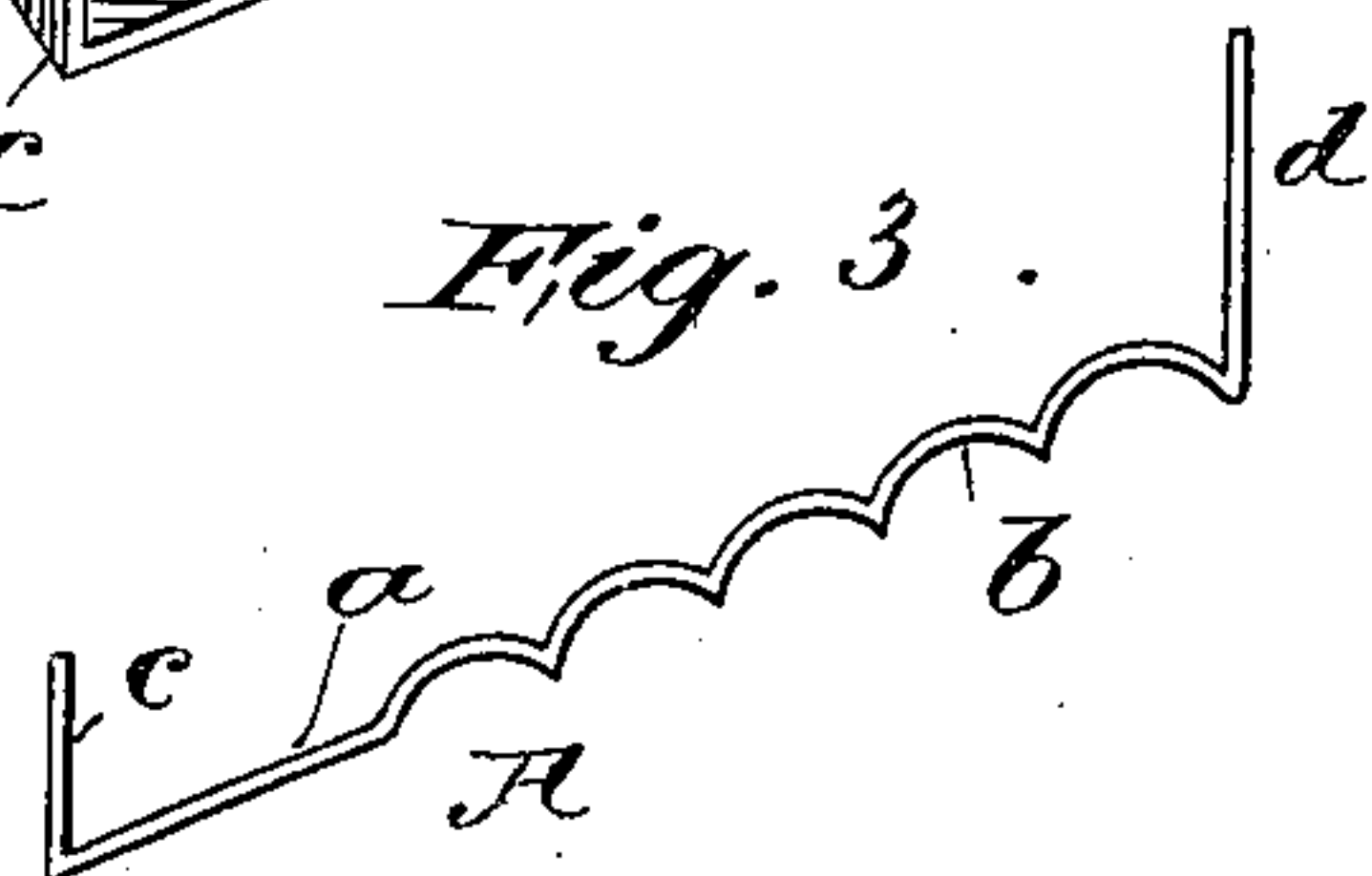
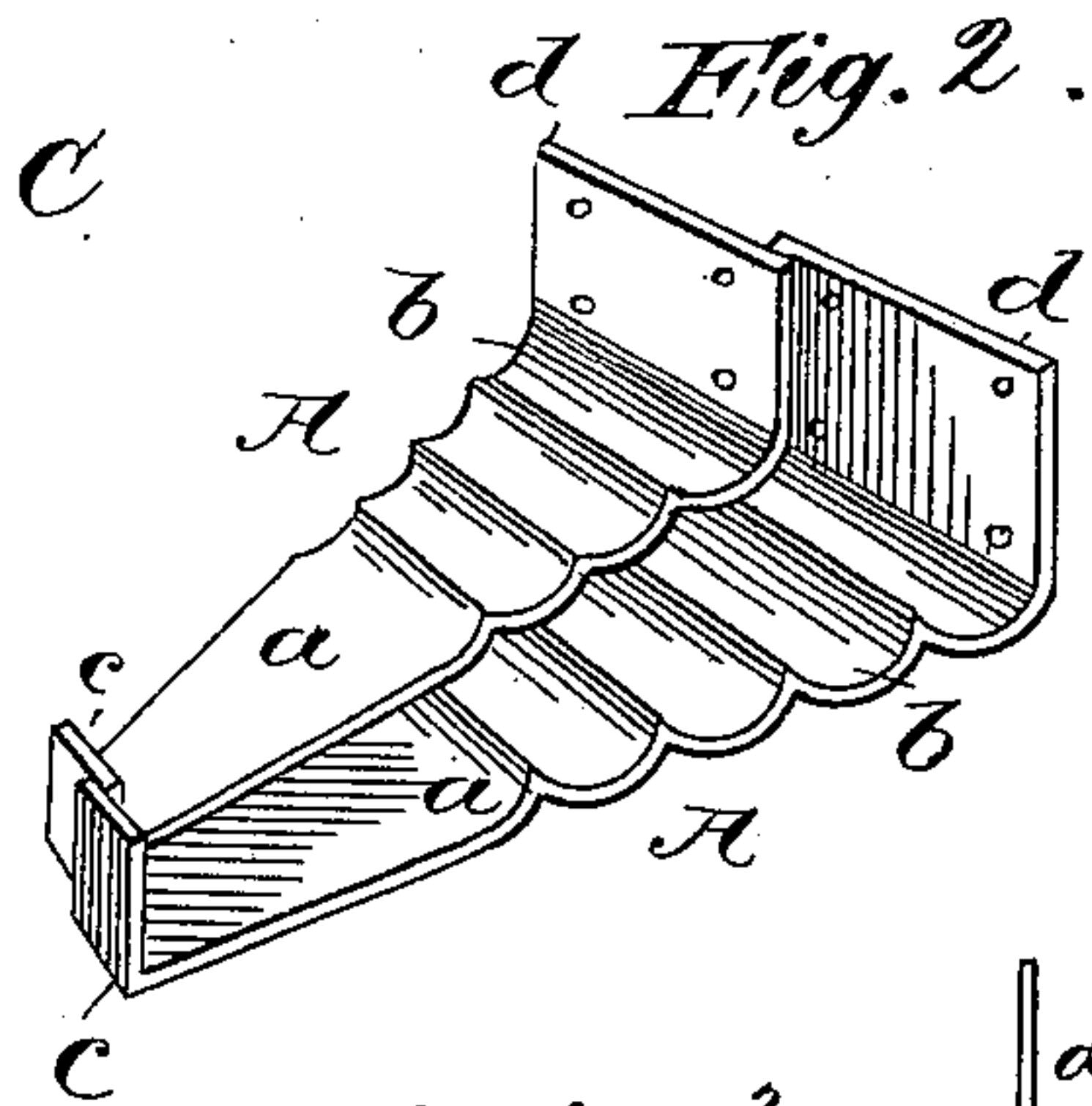
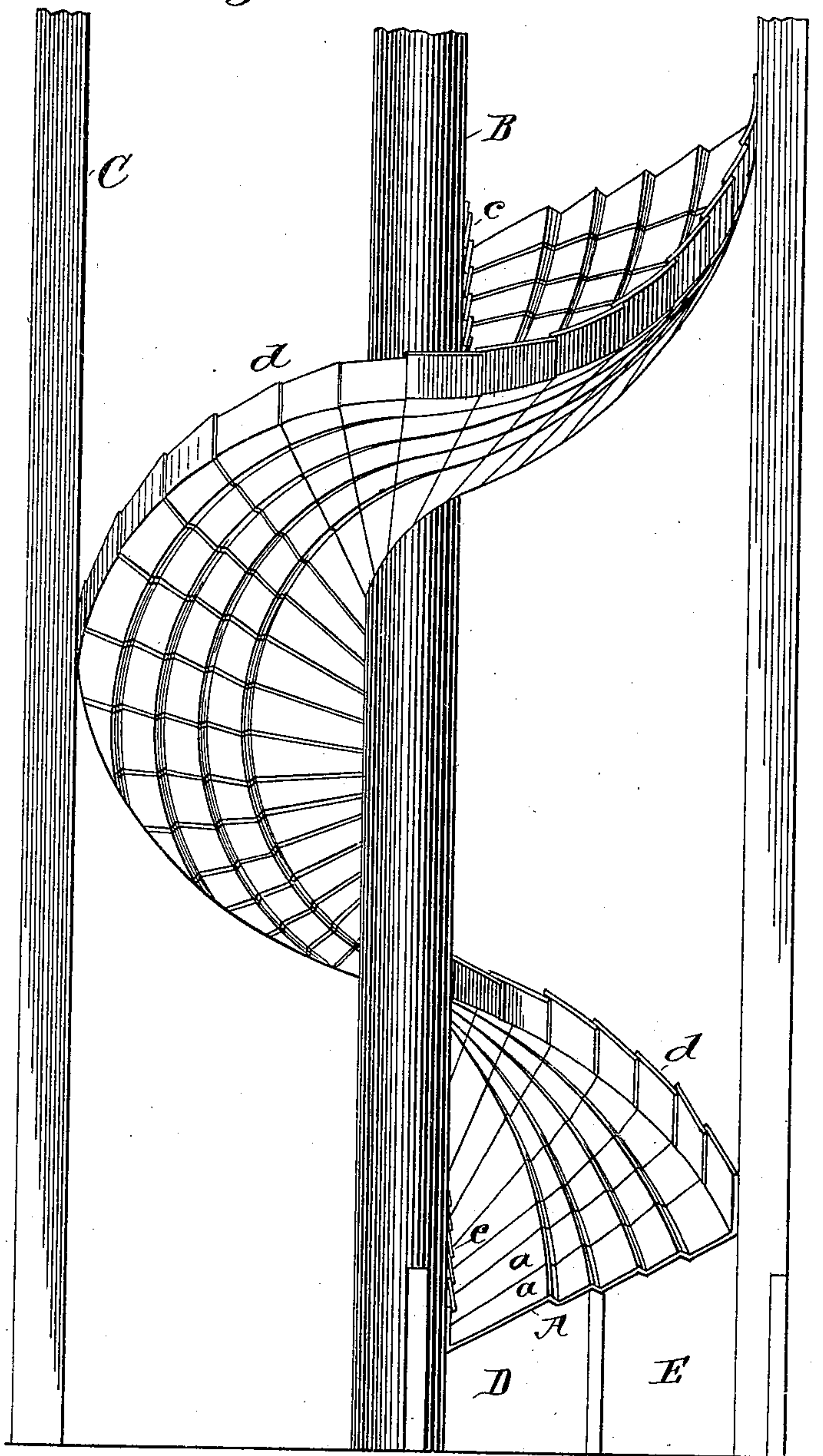
F. PARDEE.

SEPARATOR FOR ORE, COAL, &c.

(Application filed Nov. 18, 1898.)

(No Model.)

Fig. 1.



Witnesses.
C. W. Benjamin
M. H. Small.

Inventor,
Frank Pardee

UNITED STATES PATENT OFFICE.

FRANK PARDEE, OF HAZLETON, PENNSYLVANIA.

SEPARATOR FOR ORE, COAL, &c.

SPECIFICATION forming part of Letters Patent No. 629,591, dated July 25, 1899.

Original application filed May 17, 1898, Serial No. 680,987. Divided and this application filed November 18, 1898. Serial No. 696,761. (No model.)

To all whom it may concern:

Be it known that I, FRANK PARDEE, a citizen of the United States, and a resident of Hazleton, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Separators for Ore, Coal, &c., of which the following is a specification.

My invention relates to machines for separating substances differing in specific gravity or frictional resistance, the object being to provide a separator which shall be so constructed and arranged that the different kinds of substances subjected to its action will be automatically divided or assorted.

As the machine illustrated by the drawings is more especially intended for the separation of coal from slate and from "bone" or pieces of coal containing a kind of slate, usually in thin layers, the invention will be described in that connection, although it is applicable to the separation of other substances.

When anthracite coal is taken from the mines, it is mixed with more or less rocky substances, usually designated as "slate," which contain silica or other gritty matter possessing a peculiar frictional resistance when moving over other solid substances. This resistance is such during the passage of the mixed substances along the spirals of a centrifugal separator as to cause the slate and bone to move slower than the pure coal apart from the difference in velocity due to the difference in the specific gravity. The coal gliding with more rapidity and meeting with less resistance from the surface over which the several substances are made to travel passes to the outer edge of the spirals, the bone being next and the slate nearest the center. The difference in the nature and action of the substances makes centrifugal force available for purposes of separation; but that force is not wholly to be relied upon. The substances must necessarily adjust themselves to their relative positions, which requires some to cross the course of others and occasions more or less knocking of the pieces against one another. So, also, the slate or rock, as well as the bone, at times receives an impact from the substances behind it, which, or the knocking already mentioned, gives to pieces of slate

or bone a greater impetus than they would have from the mere force of gravity or of centrifugal action, and unless prevented from so doing such pieces are liable to pass outwardly beyond the intended limits and become mixed with the coal; but the peculiar frictional resistance which operates against the speed of the slate and bone when moving over another solid surface may be taken advantage of by mechanical means for overcoming any extraordinary impetus which they may receive and which will change their course, so that such pieces will proceed nearer the center of a spiral way and come within the proper limits before emerging from the machine.

For the purpose of attaining the object already stated it is important that the physical properties of the different substances to be separated be utilized, and the conditions which would otherwise be a hindrance should be measurably overcome; and to these ends the invention consists, primarily, of a machine for separating ore, coal, &c., by gravitation, centrifugal action, and frictional resistance, comprising a suitably-supported spiral way, forming a floor along which the substances pass, an inlet to and an outlet from said way, the inner face of the spirals being provided with surfaces undulating transversely to the axis of the spirals, and in the construction and arrangement of the parts, as hereinafter more fully described, and pointed out in the claims.

In the drawings, Figure 1 is an elevation of a separator or centrifugal machine having a floor with an incline on the outer part thereof, the plane of which incline, measured from its outer point, lies toward the center and toward the outlet, and also provided with undulating surfaces shown in the form of continuous spiral ledges or ways. Fig. 2 is a perspective view of two of the segments thereof, showing the manner in which the lower edges of the upper ones overlap the upper edges of the lower ones. Fig. 3 is an edge view of a segment having ridges of a concavo-convex formation, with the convex side upward, or so that they will be on the inner face of the spirals when the machine is constructed. Fig. 4 is an edge view of a segment having serpentine ridges or ledges. Fig. 5 is

also an edge view of a segment, showing a horizontal floor or plain surface extending for a certain distance outwardly from the central support and upwardly-inclined spirals having a zigzag formation of ledges which interrupt the continuity of the incline on the floor or some part thereof.

The drawings show a spiral way formed of various sections or segments A, which may be made of any suitable material, preferably metal, supported by a column or post B, to which, as shown, the flange c, at the inner end of the sections, is secured. The outer or larger ends of the sections or segments are also shown as being provided with a deeper flange d, so that when the sections are adjusted or secured in place the outer flanges of the various segments assume a regular spiral form and constitute an abutment or wall for preventing substances passing through the machine from escaping or being thrown over by centrifugal force or action. This outer wall or the larger ends of the segments are secured to posts or columns C C, as shown.

The several sections or segments are preferably formed so that when the machine is constructed the incline of the floor will have a plane sloping or pitched toward the center and toward the outlet. In such formation the weight of the substances and the centrifugal action will cause them to progress through the machine, and the difference in specific gravity or in frictional resistance will operate with the centrifugal force to effect their separation. The incline of the spirals will have an effect in checking the speed and changing the course of the substances having the greatest frictional resistance or such pieces thereof as may from any cause receive an extra impetus, which might otherwise cause them to pass so far outward as to bring them beyond the intended limits; but such formation of the spirals is not necessary to the invention as I intend herein to claim it.

In order to furnish an additional guard against the outward movement of substances which should remain near the center and also to guard against the inward movement of the substances which should remain on the outside, but rebound or drop back when striking against the outer abutment or wall d, the segments may be formed with an inner plain part a and with an outer part b, on which are ribs, corrugations, or undulating surfaces, preferably constituting continuous ledges or ways. The plain part a may be on an incline, as shown in Figs. 1 to 4, or it may project horizontally and form a flat floor for a short distance, as shown in Fig. 5, in which case the inclined spiral will be on the outer part and may be provided with undulating surfaces or ledges, as shown, or otherwise.

The corrugations or otherwise-formed undulating surfaces or ledges of the several segments A A are shown as coming into alignment with those of the adjoining segments, thus forming continuous passages or ways,

along which the substances coming into them may be conducted to the outlet of the machine. These segments are also shown as overlapping one another by having the lower edge of the upper sections come over the upper edge of the next lower section and by having the lower end of the outer flange d of the upper section come inside of the upper end of the outer flange of the next lower section, and so on. This construction and arrangement of the segments avoids difficulty in the making of joints and permits the substances to pass from one section to another with a slightly-increased impetus, owing to the jogs thus formed, and there is also no liability of lodgment.

The outlet of the spiral way or floor leads the separated substances to proper chutes D and E or as many others as may be necessary or desirable for conducting the assortments thus made away from the machine. If mixed coal, slate, and bone be fed into the spirals at the open top or inlet thereto, such substances will whirl rapidly around, and during the passage the gravitation, centrifugal force, and difference in frictional resistance will cause the coal to glide outwardly over the undulations formed on the spirals, while the bone will in the natural course of the operation come next in order and the slate will gravitate nearest the center. The several substances thus separated will emerge at the outlet of the spiral way, from which they may be conducted by the chutes provided for such purpose, as already stated.

It is obvious that the details of construction may be varied and the essence of the invention retained as respects the function of what I term "undulating surfaces" for directing certain substances inwardly, while permitting others to pass outwardly beyond them, owing to the resistance which materially affects the course of certain substances, but has no such effect on that of others.

I do not herein claim the features of construction of spiral separators which are made the subject-matter of the application filed by me on May 17, 1898, Serial No. 680,987, of which this is a division; nor do I herein claim the features made the subject-matter of the six applications filed by me on November 18, 1898, Serial Nos. 696,762, 696,763, 696,764, 696,765, 696,766, and 696,767, respectively, to which reference is hereby made; but,

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A machine for separating ore, coal, &c., by gravitation, centrifugal action and frictional resistance, comprising a suitably-supported spiral way forming a floor along which the substances pass, an inlet to and an outlet from said way, said floor being provided with surfaces undulating transversely to the axis of the spirals.

2. A machine for separating ore, coal, &c., by gravitation, centrifugal action and fric-

tional resistance, comprising a suitably-supported spiral way forming a floor along which the substances pass, an inlet to and an outlet from said way, the floor thereof being provided with continuous ledges or ways extending in the direction of the length of the spirals.

3. A machine for separating ore, coal, &c., by gravitation, centrifugal action and frictional resistance, comprising a suitably-supported spiral way forming a floor along which the substances pass, an inlet to and an outlet from said way, the floor thereof being composed of a plurality of overlapping alining sections and provided with surfaces undulating transversely to the axis of the spirals.

4. A machine for separating ore, coal, &c., by gravitation, centrifugal action and frictional resistance, comprising a suitably-supported spiral way forming a floor along which the substances pass, an inlet to and an outlet from said way, the floor thereof being composed of a plurality of overlapping alining sections provided with continuous ledges or ways.

5. A machine for separating ore, coal, &c.,

by gravitation, centrifugal action and frictional resistance, comprising a suitably-supported spiral way forming a floor along which the substances pass, an inlet to and an outlet from said way, said floor being provided with an incline the plane of which pitches toward the axis and toward the outlet, said floor having surfaces undulating transversely to the axis of the spirals.

6. A machine for separating ore, coal, &c., by gravitation, centrifugal action and frictional resistance, comprising a suitably-supported spiral way forming a floor along which the substances pass, an inlet to and an outlet from said way, said floor being provided with an incline the plane of which pitches toward the axis and toward the outlet, said floor being also provided with continuous ledges or ways extending in the direction of the length of the spirals.

FRANK PARDEE.

Witnesses:

A. M. EBY,

GUST. FISCHER.