

No. 629,592.

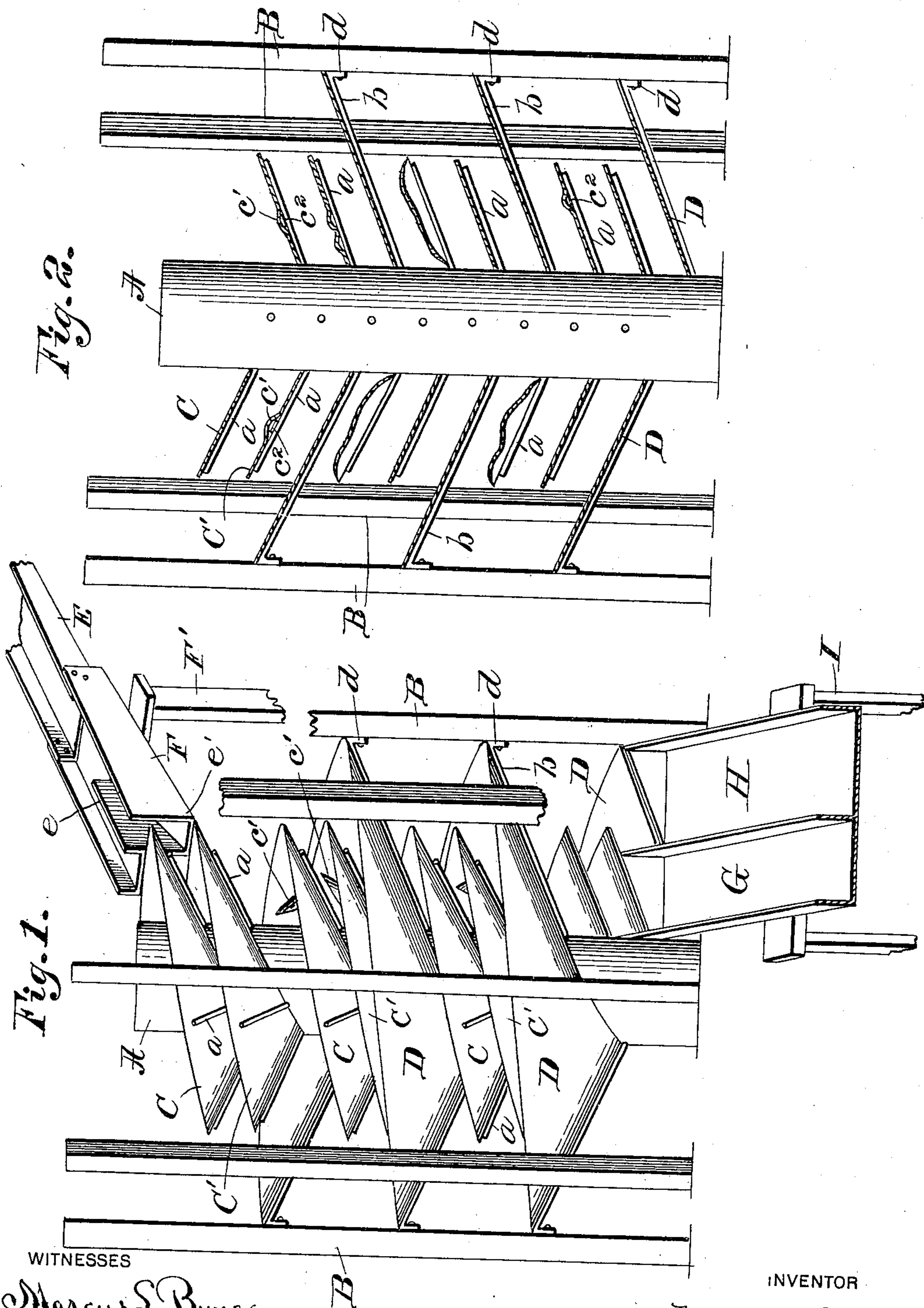
Patented July 25, 1899.

F. PARDEE.
SEPARATOR FOR ORE, COAL, &c.

(Application filed Nov. 18, 1898.)

(No Model.)

2 Sheets—Sheet 1.



Marcus L. Byrnes,
A. G. Keyman.

Frank Pardee
by Herbert R. Pardee,
Attorney.

No. 629,592.

Patented July 25, 1899.

F. PARDEE.
SEPARATOR FOR ORE, COAL, &c.

(Application filed Nov. 18, 1898.)

(No Model.)

2 Sheets—Sheet 2.

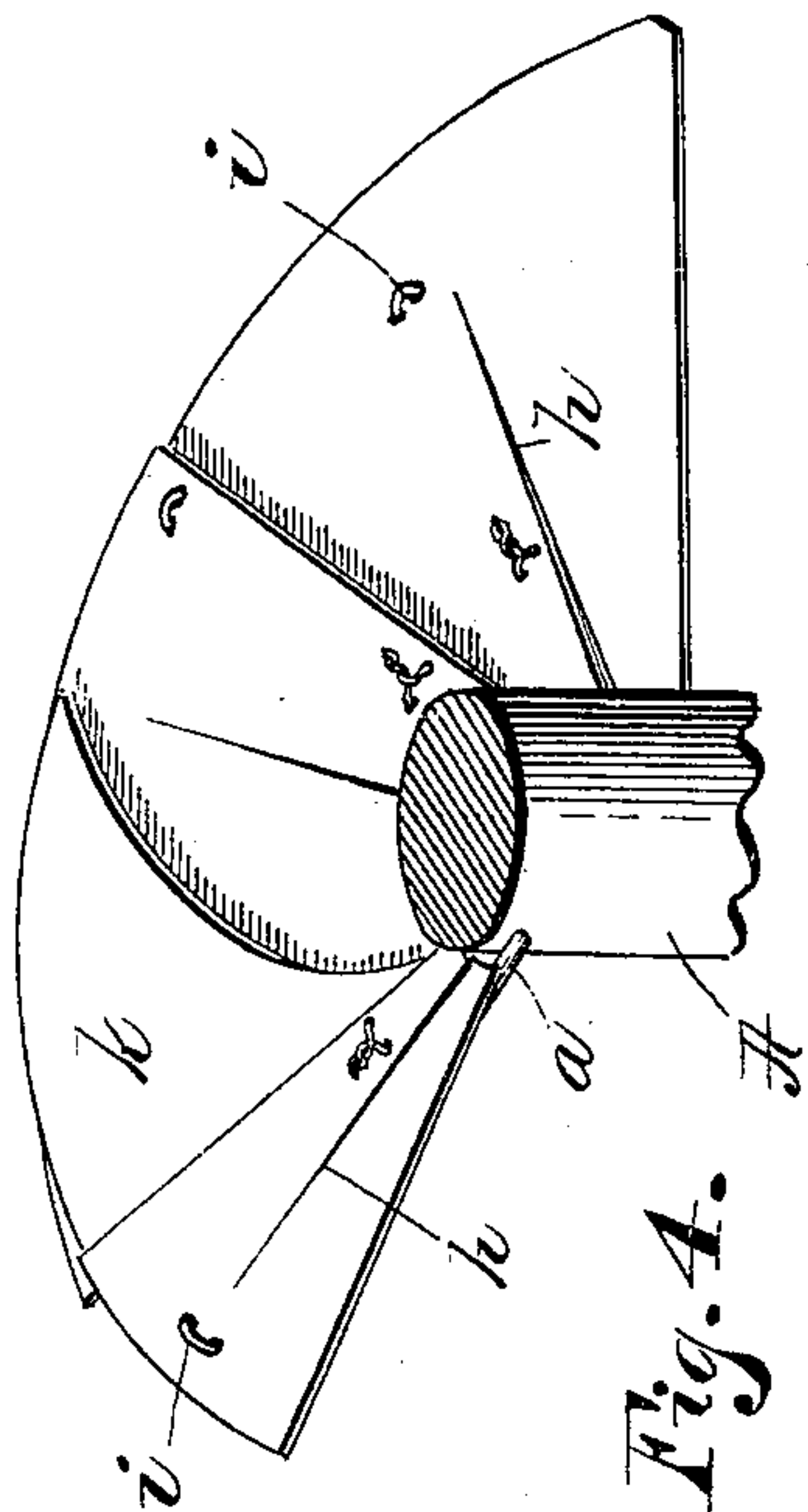


Fig. 4.

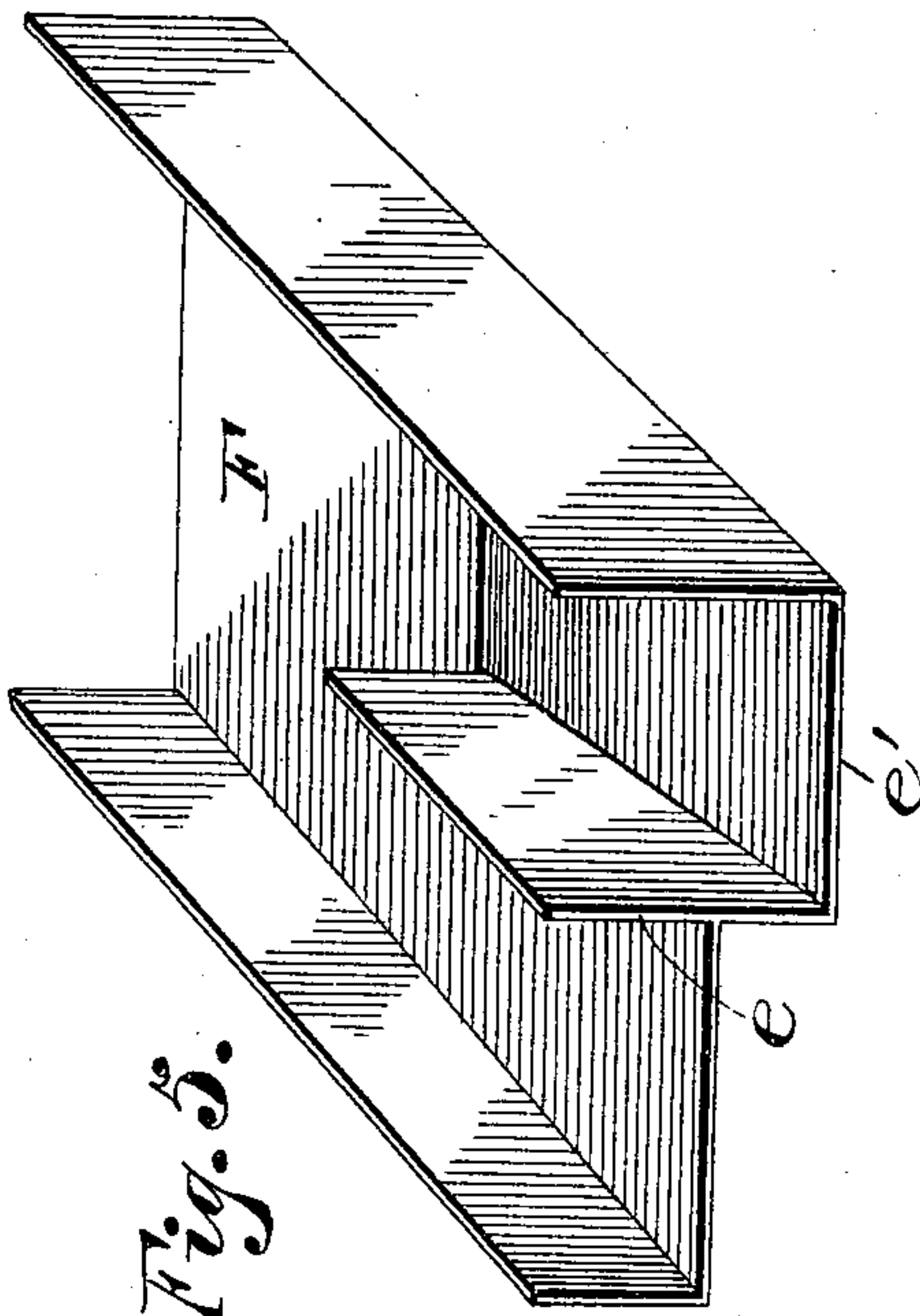


Fig. 5.

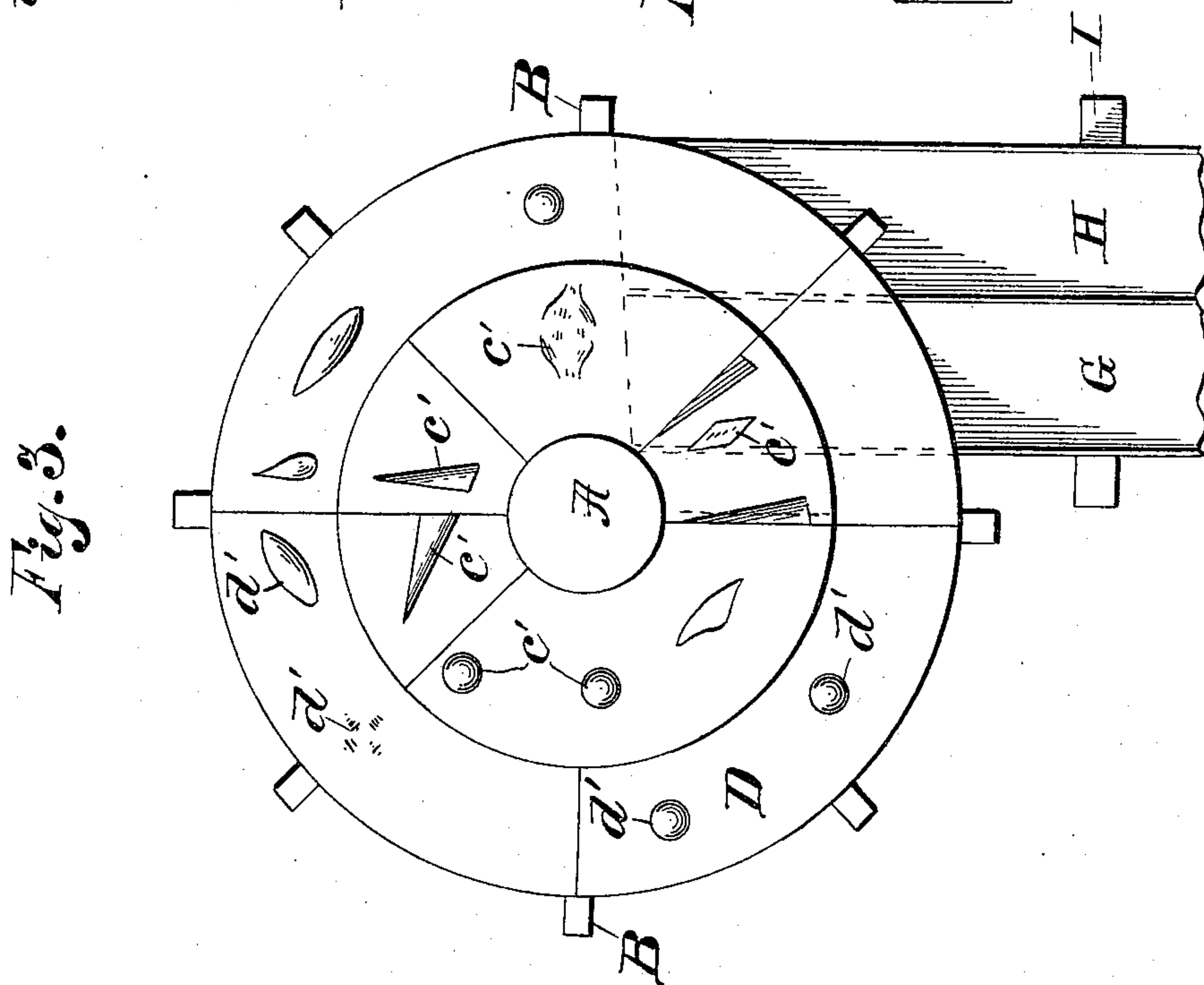


Fig. 3.

WITNESSES
Marcus L. Bying.
A. G. Heymann.

INVENTOR
Frank Pardee
by Herbert H. Banning
Attorney.

UNITED STATES PATENT OFFICE.

FRANK PARDEE, OF HAZLETON, PENNSYLVANIA.

SEPARATOR FOR ORE, COAL, &c.

SPECIFICATION forming part of Letters Patent No. 629,592, dated July 25, 1899.

Application filed November 18, 1898. Serial No. 696,762. (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 that class of ore and coal separators provided with spiral ways for causing the machine to operate on the substance to be separated by centrifugal action; and as it is more especially intended for use in separating coal from slate, as well as from "bone" or pieces of coal containing a kind of slate usually in thin layers, the invention will be described in that connection, although 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 solid surfaces. This resistance is such during the passage of the mixed substances along the spiral of a centrifugal separator as to cause the slate and bone to move slower than the pure coal notwithstanding the difference in velocity due to the difference in the specific gravity of the respective substances. 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. This difference in the nature and the 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 receive an impact from the substances behind them, 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 an extraordinary impetus which they may receive and changing their course, so that such pieces will proceed nearer the center of the spiral way and come within the proper limits before emerging from the machine.

The object of this invention is to secure certain advantages by so constructing the spirals of a centrifugal separator as to present contact-resisting surfaces for giving an inward turn to certain substances while permitting others to pass outwardly beyond them.

To this end the invention consists of a machine for separating ore, coal, &c., by gravitation, centrifugal action, and frictional resistance having a suitably-supported spiral way constituting a floor over which the substances pass, an inlet thereto, and an outlet therefrom, said floor being provided with an incline the plane of which pitches toward the axis and toward the outlet of the spiral way, said floor being provided with segregated surfaces deviating from the plane of the floor, disposed at different points on the spiral, and arranged to direct the course of certain substances toward the axis of the spiral way, and, further, in the constructions as hereinafter more fully described and pointed out or indicated in and by the claims.

In the drawings, Figure 1 is a perspective of a separator having two small and one large spiral ways and embodying the invention. Fig. 2 is a view in elevation of the framework or supports and a vertical transverse section of the spirals of the same. Fig. 3 is a plan view showing more clearly the irregular surfaces on the surface of the spirals, the feed-chute being omitted and the discharge-chute shown. Fig. 4 is a detail perspective of a portion of the smaller spiral, the spiral showing another form of irregular surface. Fig. 5 is a detail perspective of the chute for feeding the material to the smaller spirals.

In the drawings, A designates a central supporting column or post, and B B outer posts or columns. The inclined arms *a a* support

the smaller spiral ways C C' and the arms b b the larger spiral D, the arms a a projecting from the post A and the arms b b from the post A to the posts B B, to which they are shown as being secured at d d. The machine may be made with only one spiral way, or, if desired, it may have two or more, and they may be constructed of any suitable materials and supported in any suitable manner. The arms a a and b b incline upward from their inner ends, so that the plane of the floor formed by the spirals will have or may be provided with a pitch inclined toward the center and toward the outlet of the incline.

The smaller spirals C C' are intended to receive the mixed coal and slate as it comes from the mine and after being broken. In a coal-breaker it would ordinarily pass from the sizer down the feed-chute E, to which a partitioned feed attachment F is connected and secured, being properly supported in any manner, as by a bench-support F', as indicated in Fig. 1 of the drawings. This feed-attachment inlet-chute F is preferably divided by a partition e, so as to part the entering substances into streams and feed both the smaller spirals C C', that part of the feed attachment having a sufficient drop to effect the entrance of the material to the spiral C', as indicated at e', in a machine that has more than one spiral, or, if desired, inlet-chutes may be provided for feeding each of the spirals. The spirals of the machine connect with or lead to outlet-chutes G for the slate and bone and H for the coal. The chutes G and H are suitably supported, as by a bench I, both of said chutes leading from the lower end of the large spiral D, and, as shown, are arranged so that the chute G takes the discharge of bone and slate from the inner portion of all the spirals, while the chute H takes the discharge of coal from the outer edge of the terminus of the small spirals and from the outer portion of the large spiral.

The inner face of the floor of one or all of the spiral ways C C' and D are provided at different points between the inlet and outlet of the machine with irregular or deviated surfaces, as c' c' and d' d', plan views of which appear in Figs. 1 and 3. In Fig. 4 the irregular surfaces for turning the bone and slate inwardly are shown as being formed by slits the edges of which are lapped, as at H, and secured by staples i or by any other suitable means. In addition to such construction this Fig. 4 also shows a plate k, which presents a surface deviated from the floor of the spiral and having an edge which preferably has an inward-curved lower edge k', constituting a ridge to check the outward course of the bone and slate and give them the desired turn. These surfaces, of whatever form, are disposed to act on pieces of slate or bone which may for any reason have sufficient impetus to carry them too far outward, so that when they come in contact with such surfaces the resistance offered by the same will check

their speed and change their course inwardly and so cause them to gravitate toward the center or where they will emerge from the machine in their proper places.

The form of the irregular surfaces or surfaces deviating from the plane of the floor on the spirals is practically immaterial, for the resistance is such that slight obstacles will change the course of the slate, while coal will glide over or around the same impediments and come on the outside of them. It is of course desirable that the course of the slate be changed without bringing it to a stop, and hence abrupt projections or abutments, which might have a like effect upon the coal, should be avoided on all such parts of the machine as would be too near the outlet for permitting the substances to regain their relative positions.

The surfaces deviated from the plane of that formed by the spirals may take the form of humps, hills, ridges, studs, or other irregular forms which will perform the intended function; but in order to do this it is desirable that they should not be too closely interspersed, and for purposes of this invention they are disposed at different points between the inlet and the outlet of the machine.

In Fig. 3 a variety of surfaces having the ability to perform the intended function are shown, some being elongated, some annular, some round, some diamond shape, and some without a defined contour, and in Fig. 2 they are shown as being formed on the sections comprising the spirals and also by the interposition of a wedge, as c² c², on the supporting-arms and on which a portion of the section above is forced to conform. So, too, these irregular surfaces need not form an integral part of the floor of the spiral, for they may be secured to the inner face of the same and may be made of stone, glass, metal, or any other resisting substance, either interposed as a part of the spiral or secured on the inner face thereof. I, however, prefer the forms of deviated surfaces which have inward inclines or extensions, as shown in the drawings.

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, nor do I herein claim the features of such a machine which form the subject-matter of the several applications filed by me on November 18, 1898, Serial Nos. 696,761, 696,763, 696,764, 696,765, 696,766, and 696,767, respectively, to which reference is hereby made.

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 constituting a floor over which the substances pass, an inlet thereto and an outlet therefrom, said floor being pro-

vided with an incline the plane of which
itches toward the axis and toward the out-
let; and having segregated surfaces deviated
from the plane of the floor and disposed at
5 different points between the inlet and outlet
of the spiral for directing certain substances
inwardly on and along the spiral way.

2. A machine for separating ore, coal, &c.,
by gravitation, centrifugal action and fric-
10 tional resistance, comprising a suitably-sup-
ported spiral way constituting a floor over
which the substances pass, an inlet thereto

and an outlet therefrom, said floor being pro-
vided with an incline the plane of which
itches toward the axis and toward the out- 15
let, and with inwardly-extending surfaces
deviating from the plane of the floor for
changing the course of certain substances
inwardly when passing through the machine.

FRANK PARDEE.

Witnesses:

A. M. EBY,
GUST. FISCHER.