(No Model.) 5 Sheets—Sheet 1.

C. WHITAKER.

CARDING ENGINE.

No. 451,351. Patented Apr. 28, 1891.

Fig. 1.

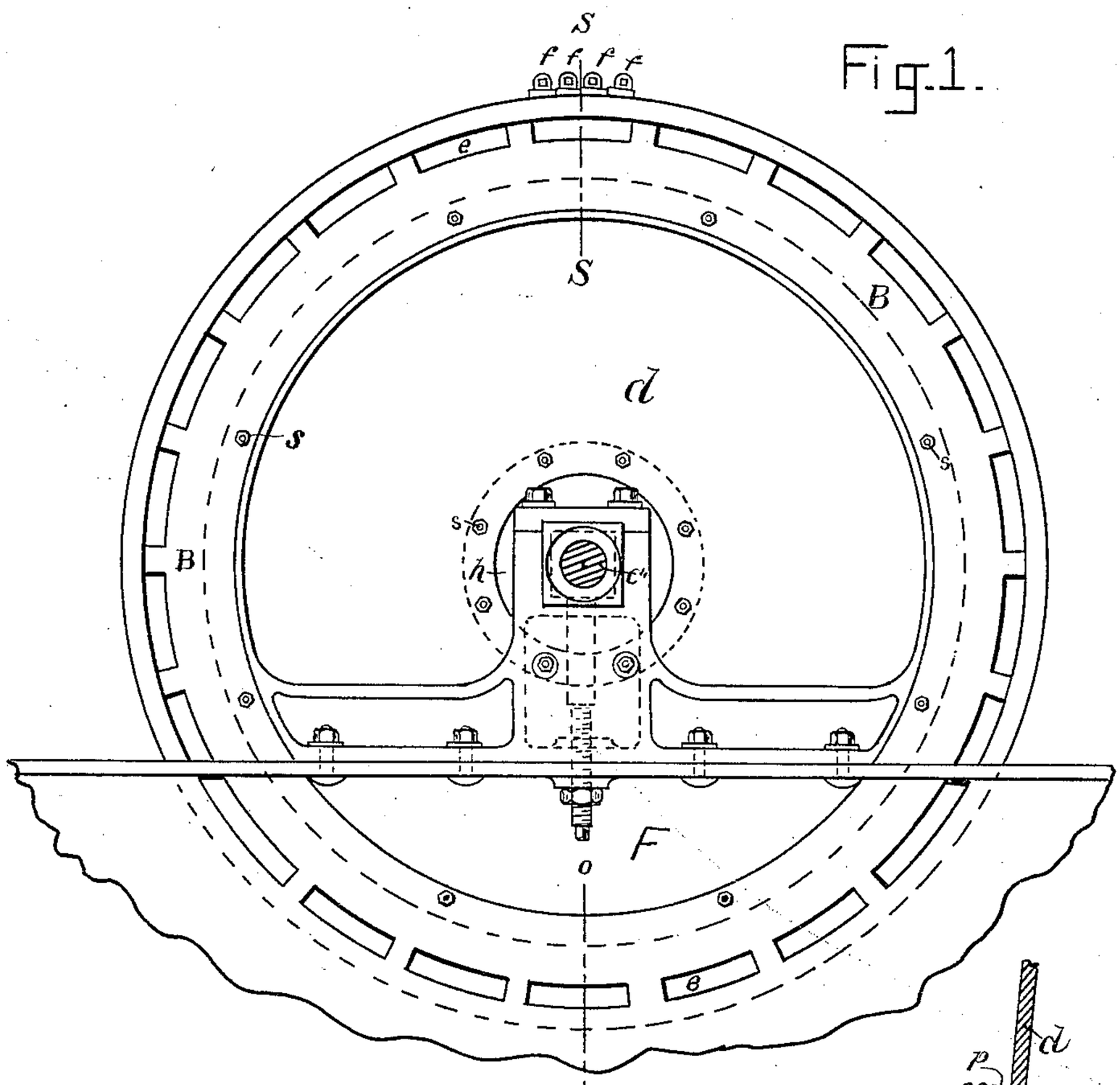


Fig. 2.

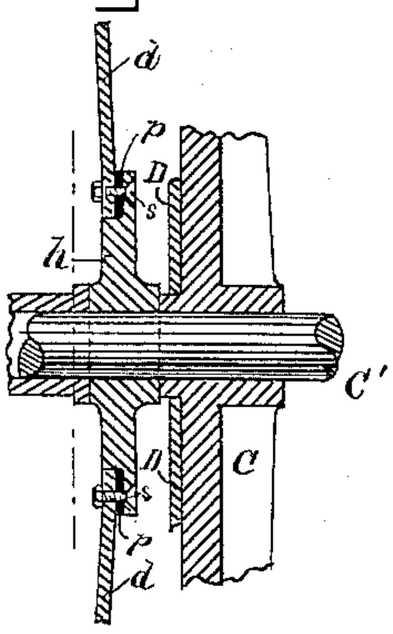


Fig. 3.

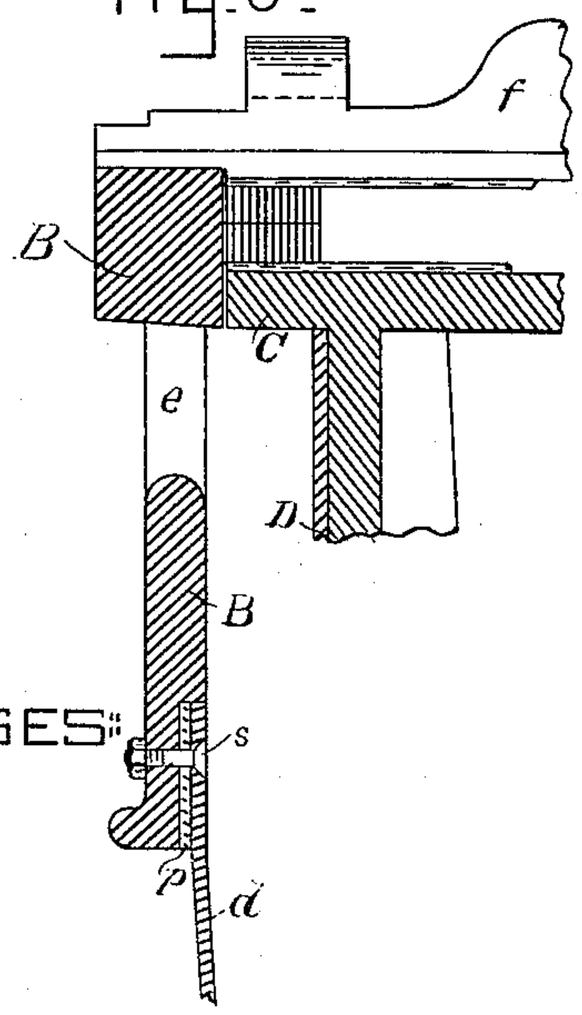
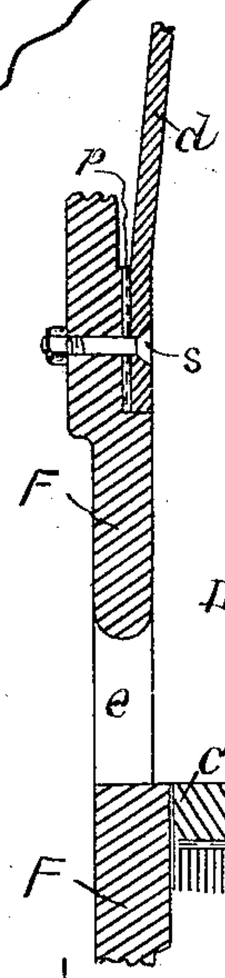


Fig. 4.



WITNESSES:

H. T. Hodges

Fred Woodies

INVENTOR:

Channing Whitaker.

(No Model.)

5 Sheets—Sheet 2.

C. WHITAKER.

CARDING ENGINE.

No. 451,351. Patented Apr. 28, 1891.

Fig. 5.

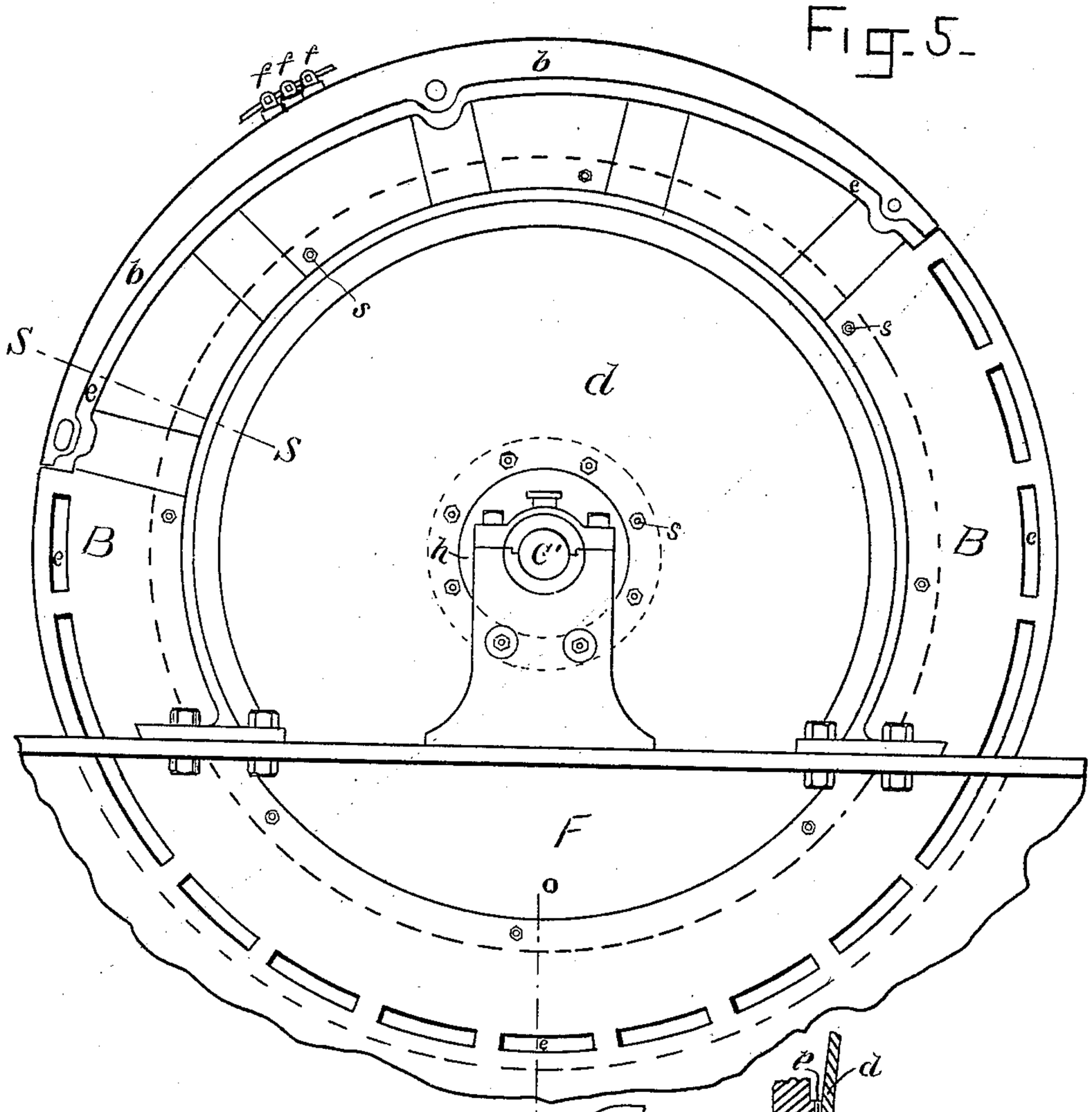


Fig. 6.

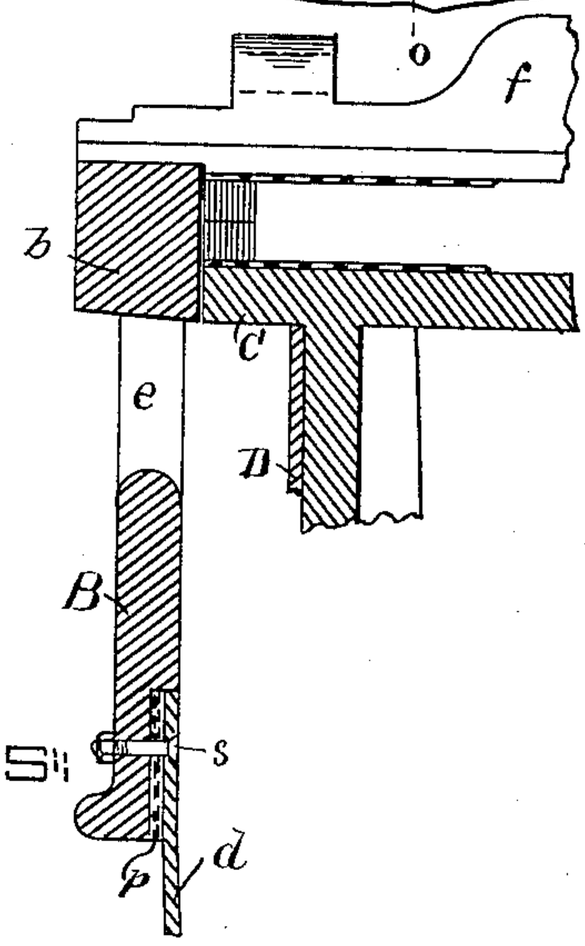
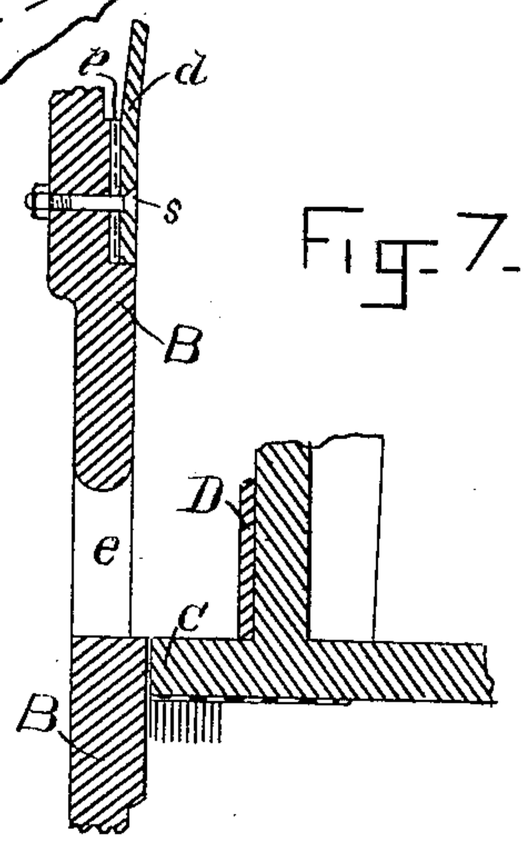


Fig. 7.



WITNESSES:
H. T. Hodges
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INVENTOR:
Channing Whitaker.

(No Model.) 5 Sheets—Sheet 3.

C. WHITAKER.

CARDING ENGINE.

No. 451,351. Patented Apr. 28, 1891.

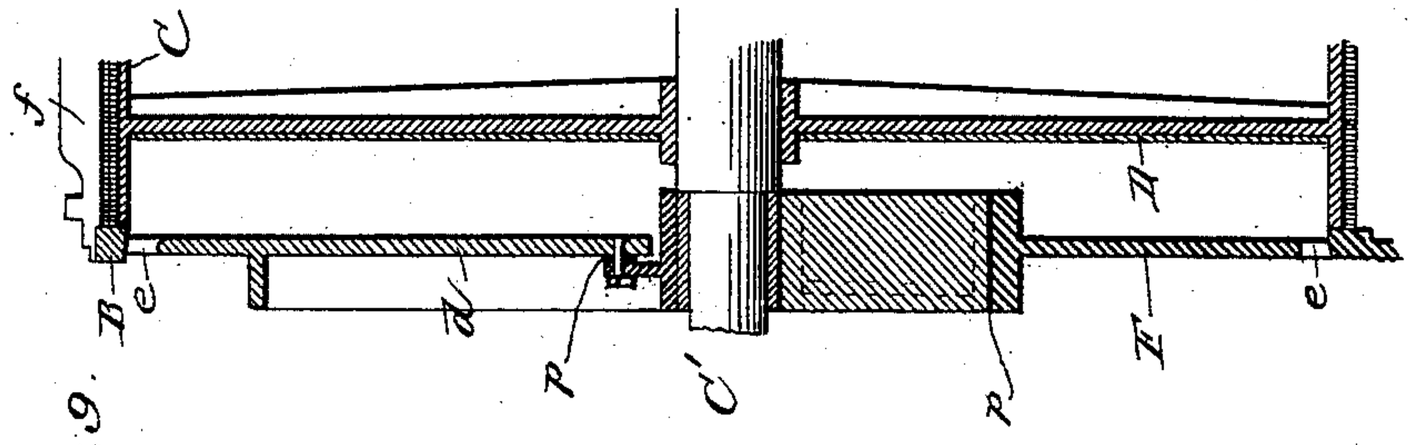

Fig. 9.

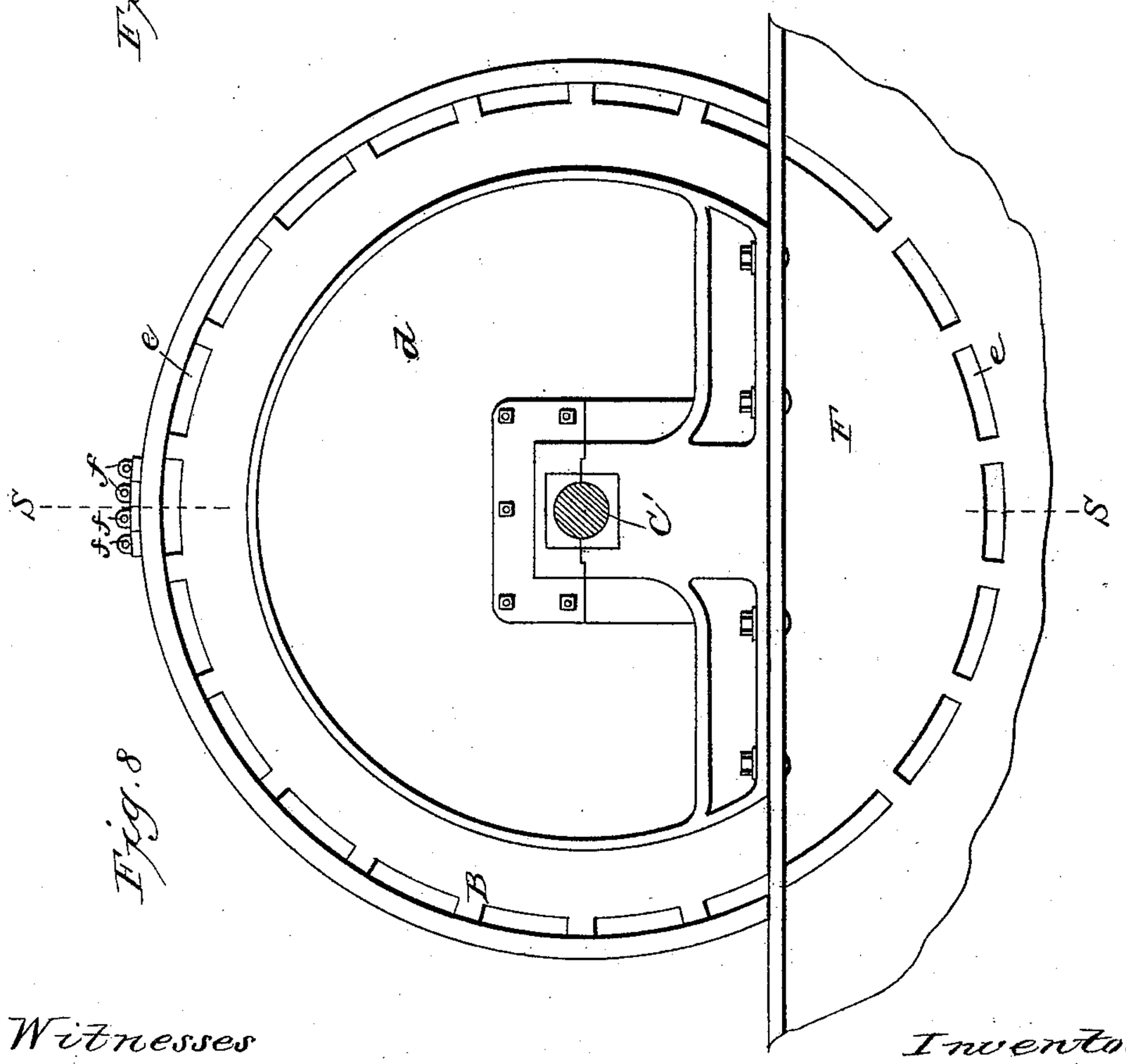

Fig. 8

Witnesses

E. B. Smith

Alvan Macauley.

Inventor

Channing Whitaker.

(No Model.) 5 Sheets—Sheet 4.

C. WHITAKER.

CARDING ENGINE.

No. 451,351. Patented Apr. 28, 1891.

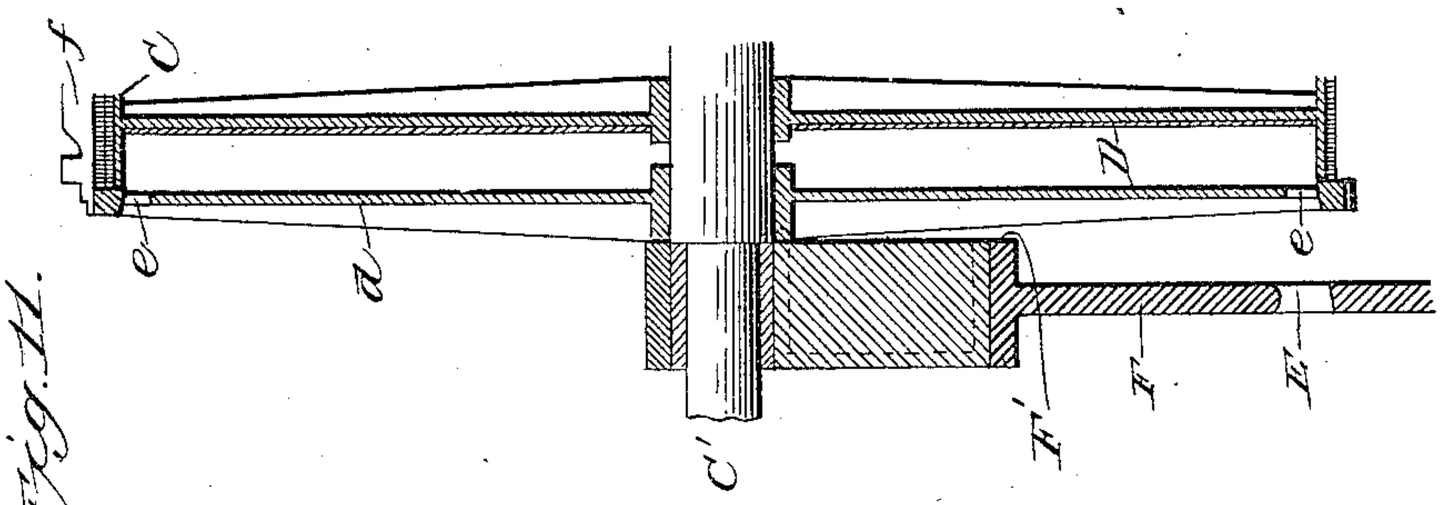

Fig. 11.

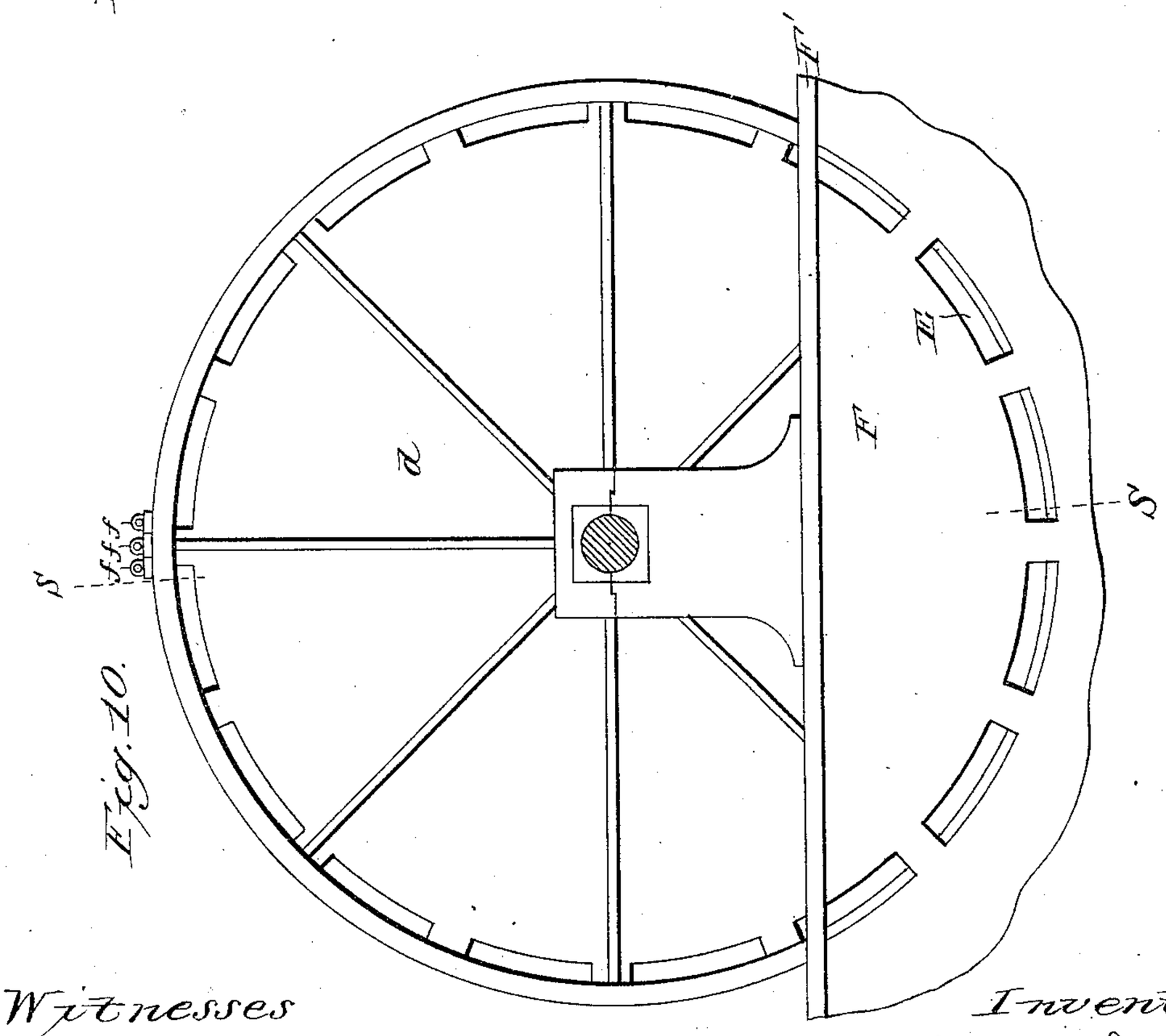

Fig. 10.

Witnesses
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Inventor
Charming Whitaker.

(No Model.) 5 Sheets—Sheet 5.

C. WHITAKER.

CARDING ENGINE.

No. 451,351. Patented Apr. 28, 1891.

Fig. 12.

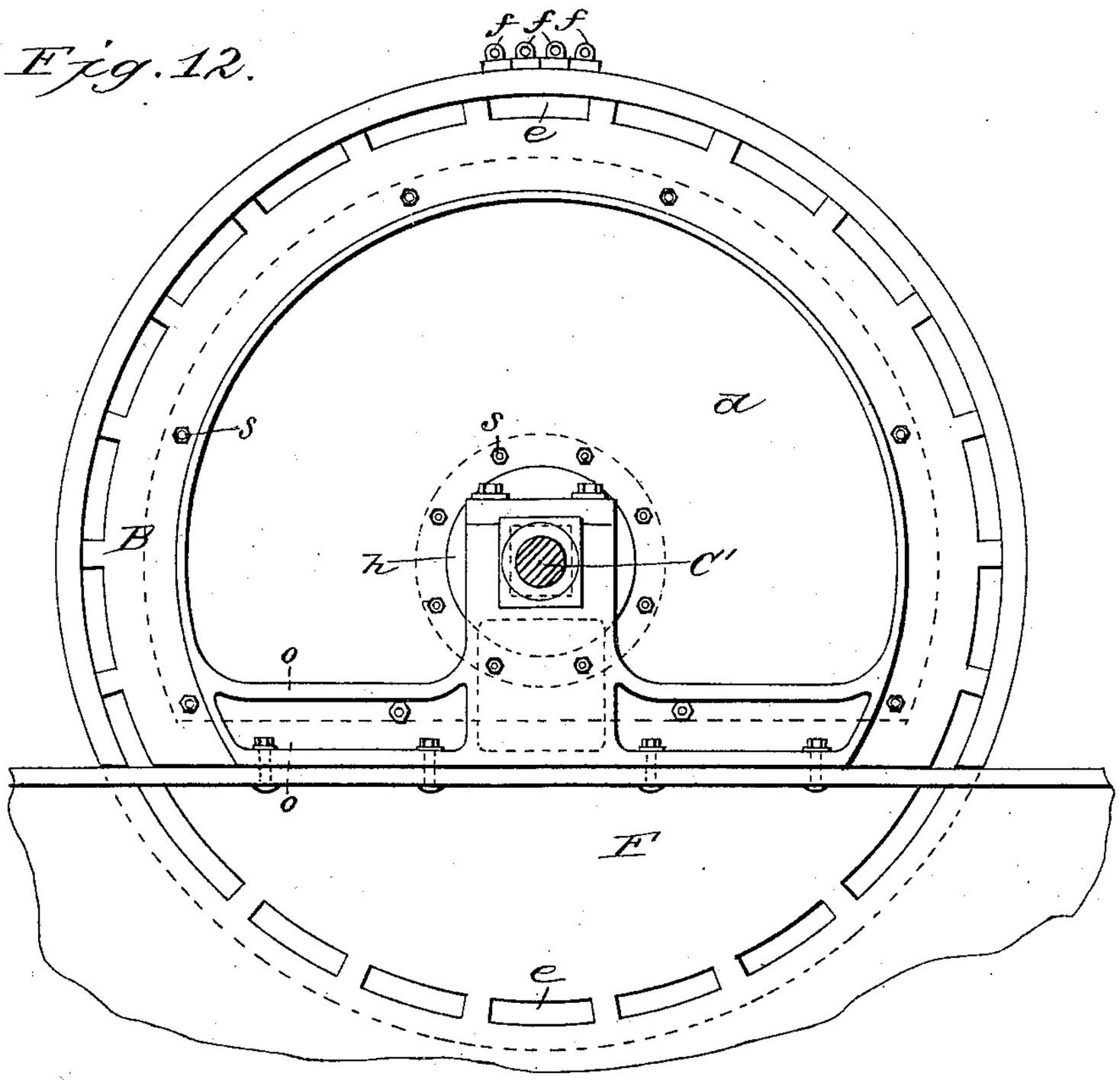
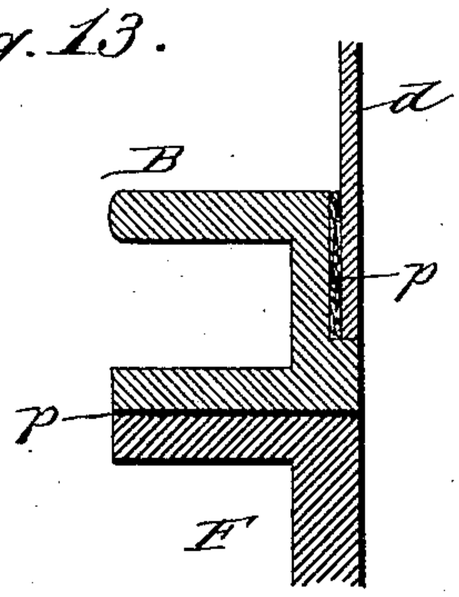


Fig. 13.



WITNESSES:

E. D. Smith

Samuel N. Foud.

INVENTOR

Channing Whitaker

UNITED STATES PATENT OFFICE.

CHANNING WHITAKER, OF TYNGSBOROUGH, ASSIGNOR TO THE LOWELL MACHINE SHOP, OF LOWELL, MASSACHUSETTS.

CARDING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 451,351, dated April 28, 1891.

Application filed July 31, 1890. Serial No. 360,587. (No model.)

To all whom it may concern:

Be it known that I, CHANNING WHITAKER, a citizen of the United States, residing at Tyngsborough, in the county of Middlesex, and in the State of Massachusetts, have invented a new and useful Improvement in Carding-Engines, of which the following is a specification.

My improvement relates to carding-engines. When fibrous material is being carded in a carding-engine and is being acted upon by the teeth of the clothing upon the main cylinder or swift, or by the teeth of the clothing upon the stationary or traveling flats, or by the teeth of the clothing upon the rollers working in connection with the main cylinder or swift, the fibers are in this part of the process more or less thoroughly disentangled from each other and straightened and laid parallel to each other. The perfect accomplishment of this work of disentangling and parallelizing the fibers is in certain carding-engines more or less interfered with by currents of air which pass along the outer cylindrical surface of the swift from its ends toward the center. When the swift revolves in air, the friction of the revolving parts against the air tends to cause the air to revolve in the same direction with the cylinder and to flow from the axis toward the circumference of the swift. In every form of carding-engine with which I am acquainted the air that has thus been set in motion presses against the interior surface of the cylindrical shell of the swift with force greater than that of the atmospheric pressure outside of the machine, for in every carding-engine with which I am acquainted there is a bend, arch, disk, or casing of some kind, which forms no part of the swift, is not attached to the swift, and does not revolve with the swift, but which operates as a dam and prevents the free escape at points as far removed from the axis of the swift as the interior surface of the cylindrical shell of the swift of the air which has been set in motion. This confined air, of pressure greater than that of the atmosphere outside of the machine, when not prevented from so doing, in endeavoring to escape presses by the ends of the swift and turning there, flows along its outer cylindrical surface toward its middle portion, finally leaving the machine through narrow spaces between the flats or through other openings, and as it flows on by fluffing up the fibrous material that is being carded interferes with the process of disentangling and parallelizing the fibers, and as it escapes through the spaces or openings carries into the surrounding air dust and valuable fibrous material.

It is customary in some carding-engines to close the ends of the swift by disks, which are placed outside of the spiders of the swift and serve to prevent or nearly prevent the flow of air into or out of the interior of the swift between these end disks. These disks are valuable additions to the swift, as they materially lessen the quantity of air which during an interval of time tends to press into the space where fibrous material is being straightened and parallelized. I have represented one of such disks in the accompanying drawings. I prefer to use such disks when it is practicable to have them fitted tightly into place, and to have their outer surfaces polished or smoothly varnished, but I do not claim their invention. However, even when the disks are used under their most favorable conditions the currents of air which I have described are set in motion by friction of the air with the outer surfaces of the disks and with those parts of the inner surface of the cylindrical shell of the swift which are outside of the disks.

The object of this invention is to permit a more perfect accomplishment of the work of disentangling and parallelizing the fibers by lessening or wholly preventing disturbance of the fibers by such currents of air. To this end I make the casing at each end of the main cylinder or swift substantially air-tight from the axis of the said main cylinder or swift to near the interior surface or inner circumference of the cylindrical shell of the main cylinder or swift, and form in such end casing, adjacent to such inner circumference, within the line of the latter, one or more orifices or openings, through which the air-currents resulting from the rotation of the main cylinder or swift may have free lateral passage. It results that the air never takes on the pressure which would force it or any con-

siderable part of it into the space where the fibrous material is being carded. I find it best to make sure that the outer circumference of the opening or openings is as far from the axis of the swift as is the inner circumference of the cylindrical shell of the swift. If the opening or openings thus formed permit with entire freedom the escape of the air which has been set in motion, the air will have no tendency to pass into the space where the fibrous material is being carded, and the perfect accomplishment of that work will not be interfered with by such currents of air.

The advantage of using a casing made substantially air-tight from the axis of the swift to near the circumference thereof, but having openings for the lateral passage of air-currents resulting from the operation of the swift, instead of a casing having a large circular opening around the shaft of the swift, will be readily understood from the following explanation. When the circular opening or orifice is used, the air readily and continuously enters near the center of the opening or orifice and flowing along the ends of the swift to its circumference is there discharged; but whenever a sufficiently large disk or shield forming part of the casing entirely closes in the machine around the central part of the main cylinder or swift and there is left only an annular opening near the circumference of the swift, or a series of openings which, taken together, are substantially an equivalent thereto, the disk or shield prevents or nearly prevents the admission of air into the space between the disk or shield and the end of the swift, while the speed of the swift remains uniform. The rotation of the swift causes the air already contained in the space between the disk or shield and the end of the swift to flow outward toward the annular opening or openings until the atmospheric pressure in this space and near to the axis of the swift is reduced below the atmospheric pressure, while the pressure in this space and opposite to the opening or openings becomes substantially equal to that of the atmosphere. If the central disk or shield is air-tight, no more air enters the space between the disk or shield and the end of the swift until the swift slackens its speed or stops. When this occurs, the air flows back into this space through the opening or openings and the atmospheric pressure is re-established throughout this space. The use, then, of this air-tight or substantially air-tight disk or shield cuts off or substantially cuts off the flow of air into the space between the disk or shield and the end of the swift as long as the speed of rotation of the swift remains uniform, and during the same time the outflow of air through the opening or openings ceases or substantially ceases. Were the carding-engine to be provided at each end of the swift with a disk or shield extending practically air-tight to or beyond the periphery or outer circumference of the swift, there would still occur during the speeding up and slowing down of the swift an undesirable movement of currents of air past the teeth near the ends of the swift, these currents passing between the ends of the swift and the disks. These currents would be directed outwardly when the swift speeded up and inwardly as it slowed down again. By forming the opening or openings within the line of the inner circumference of the swift I greatly reduce the volume of these currents past the teeth by permitting the air to move freely in and out at a point within the circle of teeth. Moreover, in my improved construction I find it expedient, in order to restrict as far as possible the radial movement of air past the circle of teeth, to form the end casing, as will hereinafter be described, so that it shall abut closely against the end of the swift outside the opening or openings in the casing.

In the accompanying drawings, Figures 1, 5, 8, 10, and 12 represent partial side elevations of different traveling flat carding-engines to which my invention is applied. Engines with inflexible bends are represented in Figs. 1, 8, and 12, an engine with flexible bends in Fig. 5, and one with a disk wheel flat support in Fig. 10. Fig. 2 is a partial section through the axis of the main cylinder of Figs. 1 and 5. Fig. 3 is a partial section taken at the line S S of Fig. 1. Fig. 4 is a partial section taken at line *o o* of Fig. 1. Fig. 6 is a partial section taken at line S S of Fig. 5. Fig. 7 is a partial section taken at line *o o* of Fig. 5. Fig. 9 is a partial section taken at line S S of Fig. 8. Fig. 11 is a partial section taken at line S S of Fig. 10. Fig. 13 is a partial section taken at line *o o* of Fig. 12.

In the figures, F represents a portion of the frame of either carding-engine; B, the main bend; C, the main cylinder or swift, and D one of the end disks of the swift. The plate *d*, preferably of mild steel or of sheet-iron, makes a part of the air-tight or substantially air-tight central disk or shield formed in the end casings, which disk or shield prevents or substantially prevents the admission of air into the space between D and *d*, except as it may pass through the opening or openings *e e*. I may form the end casing with a series of openings *e*, as in Figs. 1, 8, 10, and 12, which series is substantially a single annular orifice interrupted by bars crossing it at suitable intervals, this arrangement being suitable in connection with the inflexible bend shown in Figs. 1, 8, and 12 and with the disk wheel shown in Fig. 10. In Fig. 5 one opening for the lateral passage of the air-currents exists between the flexible bend *b* and the correspondingly-shaped recessed part of the main bend, a series of openings being formed, also, in the lower part of the main bend and the frame F.

In Figs. 1, 5, 8, and 10, *f f f* designate several flats of the chain of flats.

p p p p in Figs. 2, 3, 4, 6, 7, 9, and 13 des-

ignate rubber, leather, cloth of any kind, felt, or other packing used for making air-tight or substantially so the joints at which the plate *d* is fastened to the other parts of the end casing which are between the openings or orifices *e* and the shaft C′ of the swift.

h in Figs. 1, 2, 5, and 12 is a hub for the plate *d*, containing a hole in which the shaft C′ turns.

s s designate the screws, bolts, or fastenings by which the plate *d* is attached to other parts of the end casings.

The central disk or shield, which, as represented in Figs. 1 and 5, is composed in part of a portion of the main bend B and a portion of the frame F and the plate *d*, when constructed and provided with packing and fastenings, substantially as set forth, will be substantially air-tight.

In Figs. 1 and 5 plate *d* is circular, with a circular opening at the center thereof to fit the hub *h*. It is secured to the main bend B, the framing F, and the hub *h* by bolts passing through the said plate and the other parts mentioned at points around the rim of the plate and around the opening at the center thereof.

There are various modifications of the plate *d* which will readily occur to any mechanic skilled in the art. Thus it may be attached wholly to the main bend and the hub by fastening the lower part of the disk to that part of the main bend which connects the main bend with the pillow-block for the bearing of the shaft of the swift. This form of construction of plate *d* is represented in Figs. 12 and 13. The plate *d* may be stiffened by corrugations or by attaching ribs to it, and the plane of the fastenings of the outer portion of the plate *d* may be the same as that of its fastenings to the hub or not.

Instead of making *d* of mild steel or sheet-iron, it may be of cast-iron, and in that case it is preferably made an integral part of the main bend and of the pillow-block and fitted by an air-tight flanged joint to the top of the upper horizontal flange of the frame F, as it is represented to be in Figs. 8 and 9.

The essential thing relative to the central disk or shield as I apply it in my invention is that it shall be substantially air-tight from the axis of the swift to where the opening or openings *e e* are located, and one or more plates, plugs, or coverings may be used to make it thus air-tight.

When my improvement is applied to carding-engines of that class in which revoluble disks or wheels support the chain of flats, I prefer to make those revoluble disks or wheels air-tight, or substantially so, from the axis of the shaft of the main cylinder to the opening or openings near to the rim of the revoluble disk or wheel. I put that opening or those openings within the inner circumference of the cylindrical shell of the swift. I make it or them large enough to permit the passage of air outward or inward so freely that when the swift is revolving at its usual working speed the pressure of the air within the space between the revoluble disk or wheel and the end of the swift and near to the interior circumference of the cylindrical shell of the swift shall be substantially equal to the atmospheric pressure outside of the machine. I also remove from the external frame-work any dam which may prevent the free escape into the air outside of the machine of air that passed from the interior to the exterior of the revoluble disks or wheels through the openings made for its passage in those disks or wheels. This form of construction is represented in Figs. 10 and 11. In this case the flat supporting disk, shield, or wheel *d* revolves too slowly to cause a perceptible current of air along its exterior surface. The air which blows through the openings *e* into the space between the disk wheel *d* and the frame F as the cylinder takes on its speed can pass freely into the outer air between the flange F′ of the frame F and the side of the disk wheel *d*.

If preferred, openings E may be made through the frame F opposite to the openings *e* in the disk wheel for the escape of this air. Of course the air can pass in the opposite direction through the same passages.

In Fig. 5, wherein the flexible bend is set in a recess in the main bend and in substantially the same radial line as the main web of the latter, the opening *e e* between the flexible bend *b* and the main bend B is not everywhere as far from the axis of the swift as I would prefer to have it, because near the center of the flexible bend the increased radial dimension of the flexible bend causes the flexible bend to become a partial dam to the free exit of the air. There are, however, so many other openings which are sufficiently far from the axis that the advantages of my improvement are substantially gained by the construction which is represented in Fig. 5.

I do not confine myself to the form of the opening or openings in the end casing or to the number of openings which is represented in these drawings. Any form and number will answer which will permit the outflow and inflow of air with sufficient freedom to cause the atmospheric pressure to be substantially the same outside of the machine and in the space between the central disk or shield *d* and the disk D and near to the inner circumference of the end of the cylindrical shell of the swift while the swift rotates with a uniform speed.

In order to effect the restriction hereinbefore referred to of the movement of currents of air radially inward and outward at the end of the cylinder past the circle of teeth upon the periphery of the swift or main cylinder, I form the rigid bends B and the framing F, (shown in Figs. 1, 8, and 12 of the drawings,) or both the main bend B and the flexible bend *b* and also the framing F, (shown in Fig. 5,) or I form the parts which in other

constructions embodying my invention occupy the positions of the parts just mentioned in such manner as to project into close proximity to the end of the cylindrical shell of the swift and to abut as closely as possible to such end. This feature is illustrated in Figs. 3, 4, 6, 7, 9, and 11.

I have herein, in Figs. 5 and 6 of the drawings, shown the main bend notched or recessed in its outer edge near the top thereof and the flexible bend located in the notch or recess, and I have referred to this construction and arrangement in the foregoing description. However, I do not herein lay any claim to this feature, *per se*, for the same is claimed in an application for patent filed on the same date herewith by William P. Canning, of Lowell, Massachusetts, and myself, as joint inventors, and bearing the Serial No. 360,588.

While I have in the accompanying drawings illustrated my invention as applied to different forms of carding-engines employing traveling flats, it is to be understood that the invention is not restricted in application to carding-engines in which the flats travel around the peripery of the swift or main cylinder, for it is equally applicable to carding-engines having fixed flats, as is common, or having rollers working in connection with the swift or main cylinder.

I claim as my invention—

1. The combination, with the swift or main cylinder of a carding-engine, of a casing at the end thereof made substantially air-tight from the axis of the swift or main cylinder to near the inner circumference of the cylindrical shell of the swift or main cylinder and having adjacent to such inner circumference, within the line of the latter, an opening or openings for the lateral passage of the air-currents resulting from the rotation of the swift or main cylinder, substantially as described.

2. The combination, with the swift or main cylinder of a carding-engine, of a casing at the end thereof made substantially air-tight from the axis of the swift or main cylinder to near the inner circumference of the cylindrical shell of the swift or main cylinder, having adjacent to such inner circumference, within the line of the latter, an opening or openings for the lateral passage of the air-currents resulting from the rotation of the swift or main cylinder, and formed, as described, to abut closely against the end of the swift or main cylinder outside the said opening or openings to restrict the radial movement of air, substantially as described.

CHANNING WHITAKER.

Witnesses:
FRED WOODIES,
WM. P. CANNING.