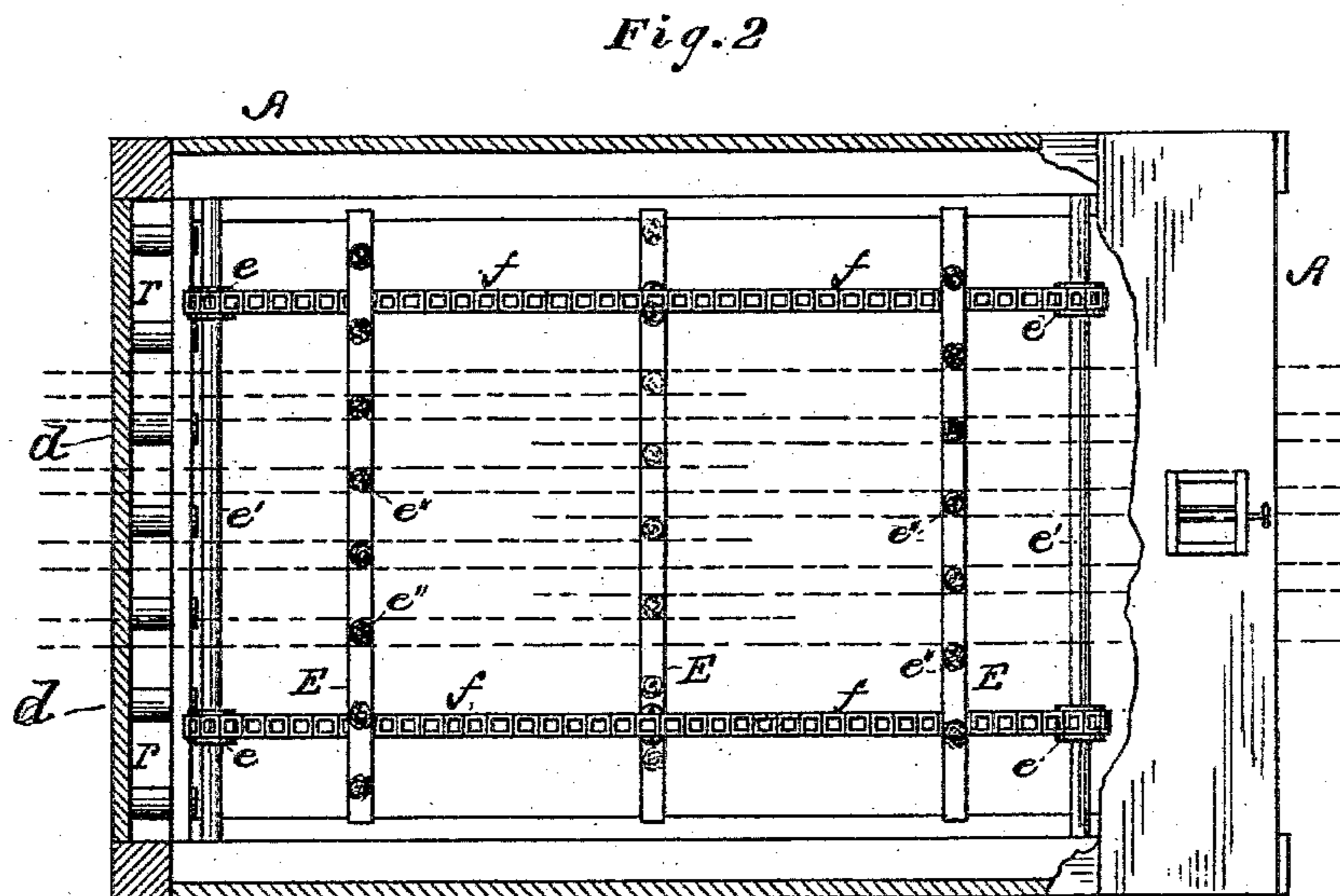
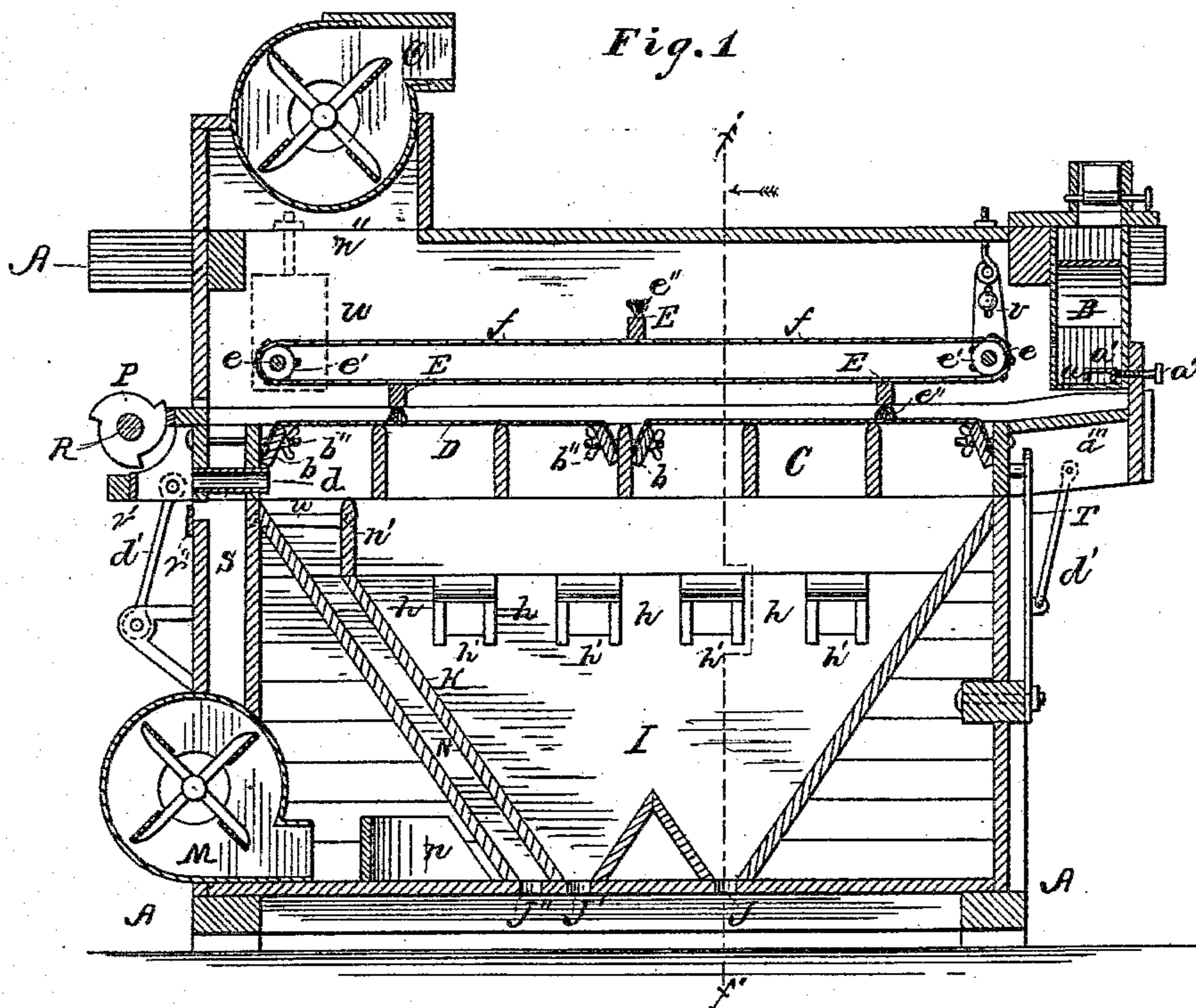


A. HUNTER.
MIDLINGS PURIFIER.

No. 296,752.

Patented Apr. 15, 1884.



Witnesses,
Henry Frankfurter.
W. L. Baker.

Inventor,
Andrew Hunter

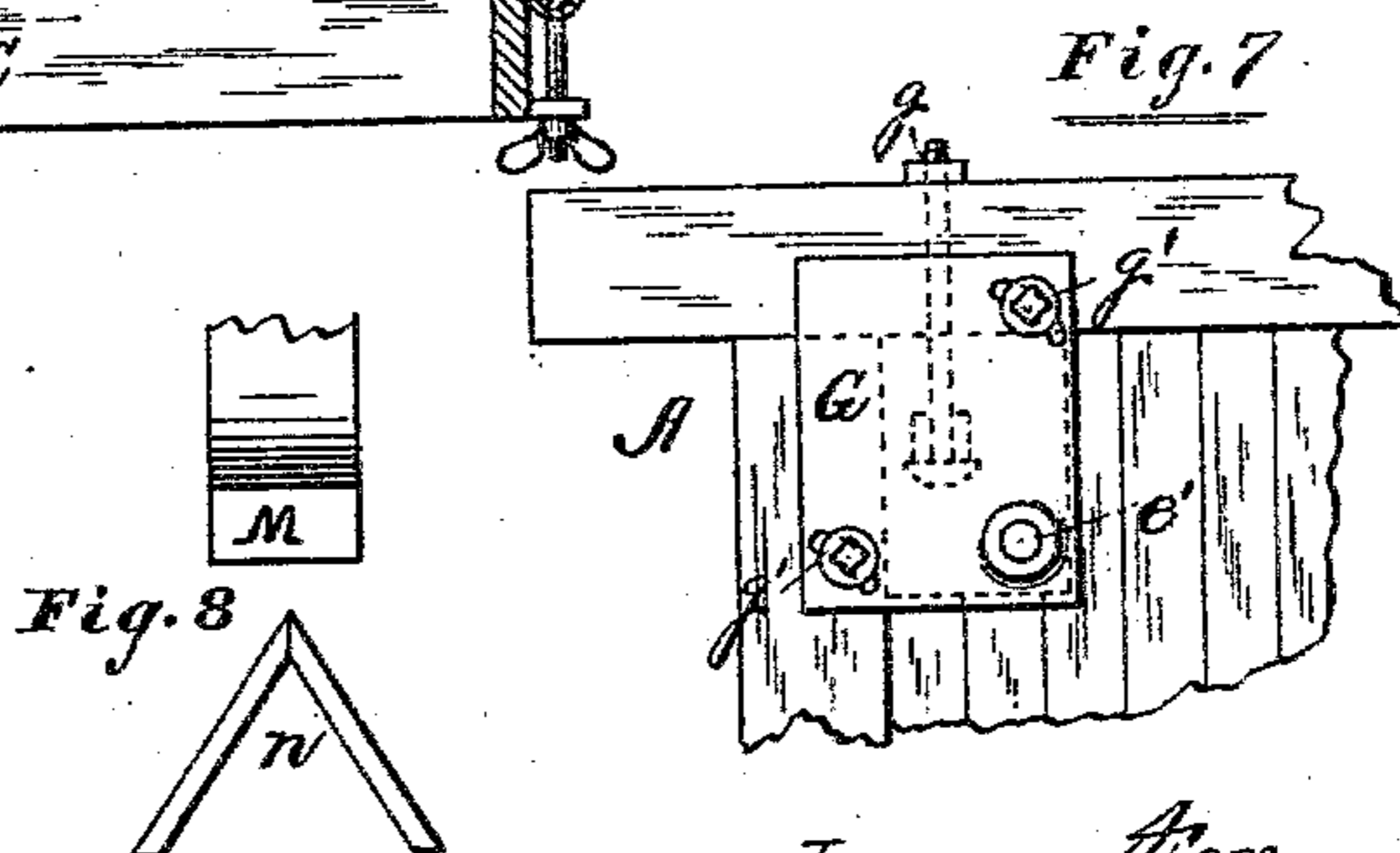
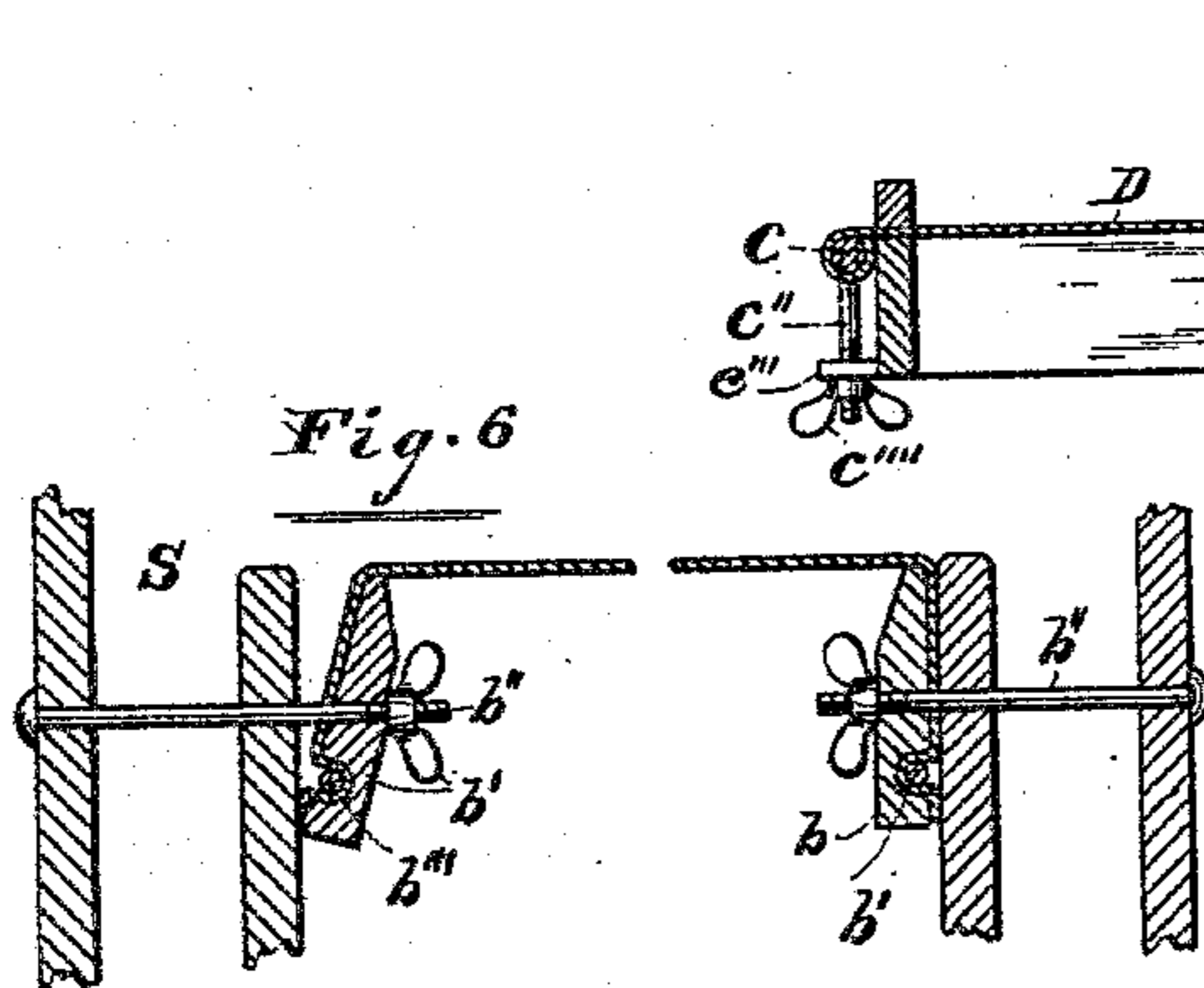
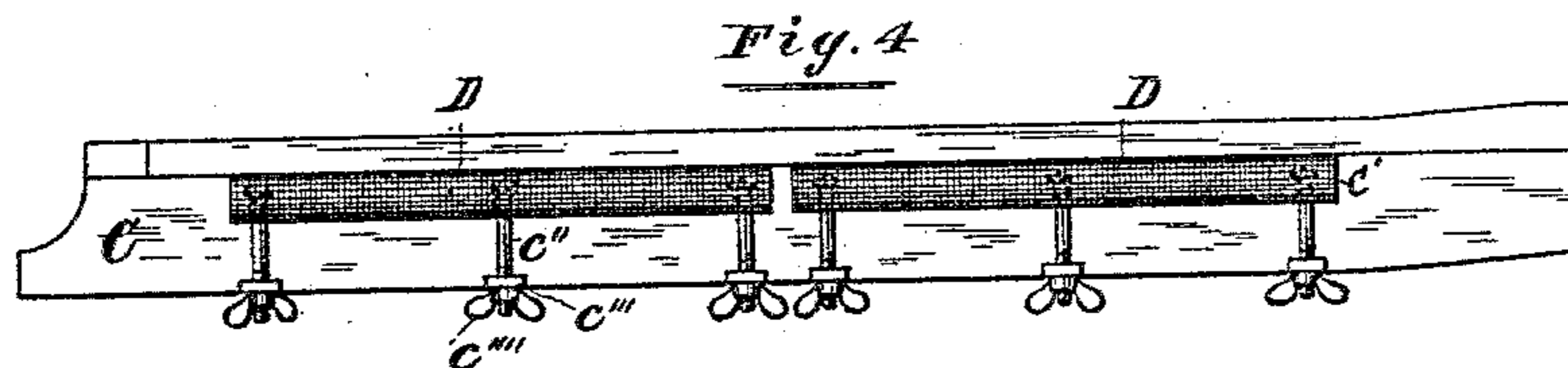
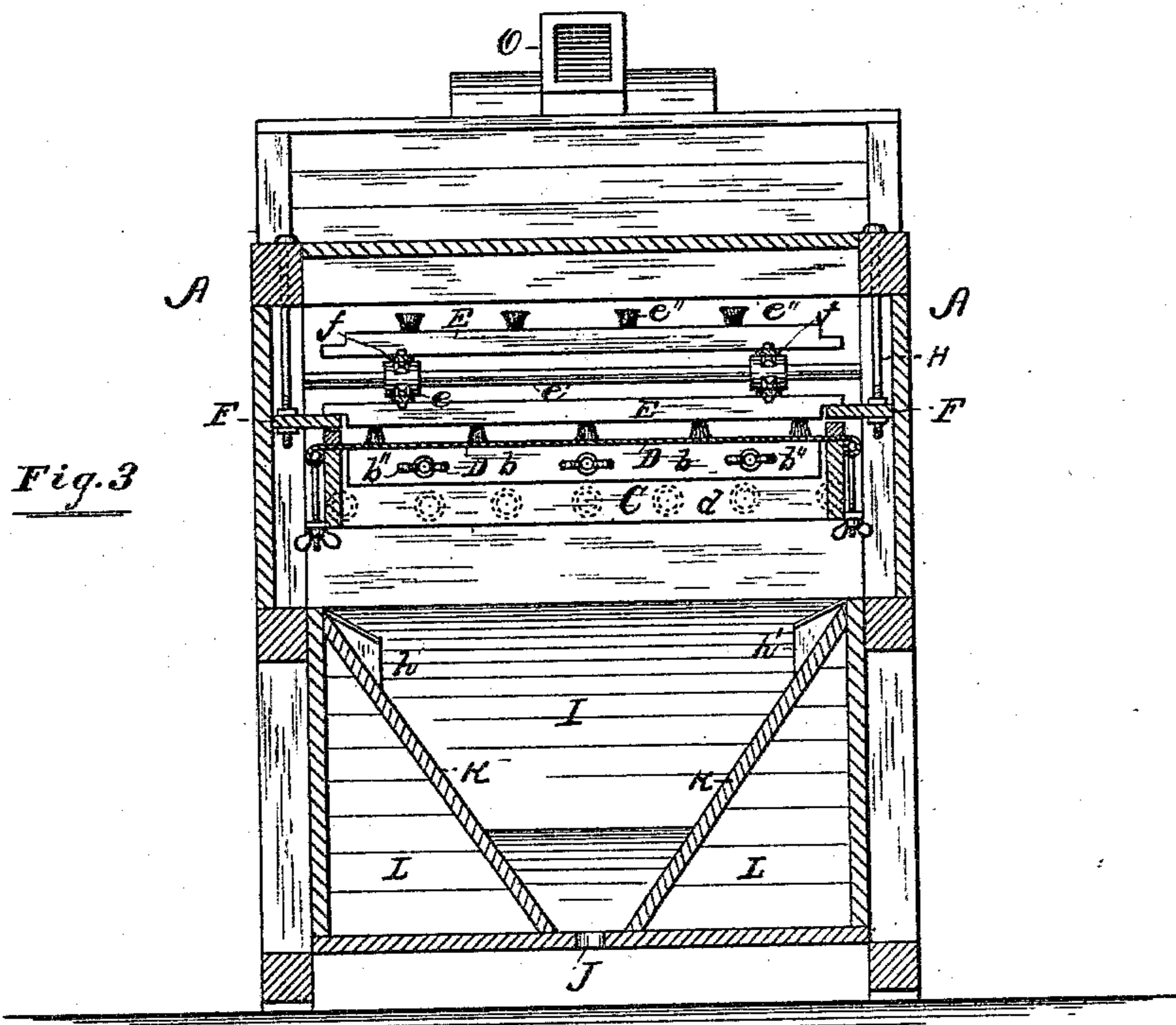
(No Model.)

2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

ANDREW HUNTER, OF CHICAGO, ILLINOIS.

MIDDLINGS-PURIFIER.

SPECIFICATION forming part of Letters Patent No. 296,752, dated April 15, 1884.

Application filed September 19, 1883. (No model.)

To all whom it may concern:

Be it known that I, ANDREW HUNTER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Middlings-Purifiers, of which the following, in connection with the accompanying drawings, is a specification.

In the drawings, Figure 1, Sheet 1, is a longitudinal vertical section of a middlings-purifying machine embodying my invention. Fig. 2, Sheet 1, is a top view with the casing broken away, showing the arrangement of the sectional brushes and their line of travel. Fig. 3, Sheet 2, is a vertical cross-section in the plane of the line $f'f'$ of Fig. 1. Fig. 4, Sheet 2, is a side elevation of the screen-frame. Fig. 5, Sheet 2, is a cross-section of the screen-frame, showing the device for tightening the cloth sidewise. Fig. 6, Sheet 2, is an enlarged view of the clamps for tightening the cloth endwise, showing one clamp closed and the other in position before closing or bolting to the frame. Fig. 7, Sheet 2, shows the arrangements of adjustable box G; and Fig. 8, Sheet 2, shows a top view of the wind-spreader n and mouth of fan M.

Like letters of reference indicate like parts.

A represents the frame of the machine, adapted to receive the working parts.

B is a receiving-hopper, into which the middlings are fed.

a is the bottom, made of zinc, containing a line of perforations for the middlings to pass through.

a' is a slide or valve which rests on the zinc bottom, and is operated from the outside of the feed-hopper by screws a'' , which, when screwed in, draws the slide back and opens the perforations. When unscrewed it closes them, thereby securing a perfect distribution of the middlings across the entire width of the shaker, not accomplished by the ordinary feed devices.

C is a screen-frame, which performs the function of a sifter. This frame has clamps attached for tightening the silk D to the cross-pieces of the frame.

$b b$ are clamps made with a groove for receiving a wire rod, b''' . The edge of the silk is laid on the clamp over the groove b' . Then the rod is inserted, which holds the silk perfectly tight. The clamps are then fastened to the screen-frame by bolts b'' . The clamps $b b$

are fastened to the cross-pieces of the shaker by bolts b'' . The bolts pass through the clamps and the cross-pieces. When the nuts are turned up it brings the two pieces together, making it impossible for the flour or middlings to escape between them. The sides of the silk are constructed with longitudinal loops c' for receiving rods c . They are fastened to the sides of the screen-frame by bolts c'' , which pass through the rods c and through studs c''' into nuts c'''' .

d are hollow tubes inserted in the cross-pieces at the tail end of the screen-frame, for supplying air for fan O.

d' are hangers or supports for the screen-frame to rest on. The upper ends are fastened to the screen-frame C and the lower ends to frame A. The hangers are placed inclining, which causes the middlings to travel over a horizontal screen.

E E E are sections of a brush constructed so that the bristles of one do not follow in the same line with either of the others, thereby requiring the action of the three sections to sweep the entire surface of the cloth.

$e e$ are shafts having sprocket-wheels $e' e'$ secured to them, for carrying link-belts f , to which the brushes E E E are fastened.

F is a side bar for supporting and carrying the ends of the brushes.

H are bolts which pass through the upper side rails of frame A and through bar F, and arranged with double nuts for regulating the height of the bar.

D is graded cloth, with fine at the head and increasing coarseness toward the tail.

I is a hopper-shaped chamber underneath the screen, with discharge-openings $J J' J''$, for the different grades of middlings to escape out of the machine.

K K are the sides of the hopper I, provided with alternate openings $h h h$ on one side, and $h' h' h'$ on the opposite. The wind from fan M enters chamber I transversely. Each transverse current assists in compressing the air under the screen.

L L are wind-trunks lying parallel with the screen-frame. The sides of the hopper K K form a part of the wind-trunks.

M is a blast-fan, which discharges into wind-trunks L L.

n is a V-shaped spreader for dividing the wind that enters wind-trunks L L.

N is a chute, formed by constructing the

hopper with a double end, leaving a space for the germ middlings to escape.

n' is a valve for regulating the cut-off at the tail end.

5 w is a rod for moving valve n' .

O is a suction-fan placed on top of the machine at the tail end.

R is the main driving-shaft.

P is the cam that imparts motion to the
10 screen-frame.

S is the tailings-discharge spout.

v are adjustable boxes at the head of the machine, for carrying shaft e .

G are adjustable boxes at the tail end, for
15 carrying driving-brush shaft e' .

$g' g'$ are bolts for fastening box G to frame A.

g is a bolt for raising or lowering box G.

T is a spring for holding the screen-frame against the cam.

20 X is an iron support for the foot of hangers d to rest on.

r is an opening at the tail of the screen-frame, for the tailings to escape that are separated from the middlings.

25 The operation of the parts now described is as follows: The middlings are fed into the hopper B and fall evenly on the projecting end d''' of screen-frame C. The percussive movement precipitates the heavy middlings to the
30 bottom, leaving the light on top. By the time the middlings reach the silk, the light fluffy material is on top, and held thereby the pressure from fan M, which operates on the under side of the silk. The fluffy matter as it approaches
35 the tail end is lifted up and carried off by suction-fan O. The cross-currents produced by fan M, entering transversely through the openings $h h h$ on one side of the cant-boards, and $h' h' h'$ on the opposite side, prevent the air from rushing
40 to the tail end, where it could escape readily. The pressure under the screen stops the fiber from sifting through cloth D. Therefore it does not depend upon the quantity of air passing through the cloth to make a separation, as is the case with exhaust-machines.
45 The air-pressure under the cloth combined with a suction at the tail end, and a traveling brush on top of the cloth, enables the machine to treat three times the quantity of middlings
50 as a machine that is provided with only a suction or a blast. The middlings as they travel over the screen, on account of their uneven form, stick in the meshes of the cloth, and always from on top; consequently the necessity
55 of an automatic traveling brush on top of the screen.

The great objection to a brush traveling on top of the screen has been that it either carried the middlings in front or piled them up
60 behind. In both cases the middlings were carried over the end of the screen with the tailings and wasted. A brush made with the bristles close together produces the same results as a scraper, and has a tendency to force
65 the impurities through the silk, and paste it, and cause the silk to wear rapidly. In order to overcome the above objections, a brush

must be made in sections, as shown in Figs. 2 and 3. The brush must be made with the bunches of bristles in each section set far
70 enough apart so that they will pass over the screen and not disturb the middlings. The brush must be made in sections, whereby the bristles in one will not travel in the same path traversed by the others, and so arranged that
75 the three sections perform the same functions as a single brush. The sections are placed equidistant on the chain f , which relieves the cloth of nearly two-thirds of the weight of an ordinary brush. A single section as it travels
80 over the cloth does not disturb the middlings, only on the line of the bristles which are set about one and a half inch apart. If the middlings travel faster than the brush-section, they pass through the spaces between the
85 bristles; therefore the traveling of the middlings is not disturbed by the action of the brushes sweeping over the screen. The sections E E E follow in succession, sweeping the entire surface without carrying over the tail
90 any middlings to be wasted with the tailings.

In order to make a sectional brush work effectually, the ends must be supported, as shown in Fig. 3, on bars F, placed over the
95 edge of the screen-frame. The bars are connected to frame A by bolts H, which are provided with nuts on the top and bottom of bar F, for raising or lowering it. The ends of the sectional brushes rest on the bar. Their pressure on the cloth is regulated by the adjustment of bar F with bolts H. By raising the
100 bar F it lifts the brushes from off the screen, and by lowering they press heavier. Graded cloth is used on the screen, commencing with fine at the head, and increasing in coarseness
105 toward the tail. The middlings as they travel over the cloth sift through, and are graded. Those that pass through the first half of the screen are discharged at opening J, in the bottom of the hopper, the coarser middlings at
110 J', and the germ middlings at J''. The quantity of germ middlings is regulated by valve n' . The heavy tailings, with pieces of middlings attached, pass over the tail end of the screen, and are discharged through chute S.
115 As they descend they are met by an upper current of air produced by fan O, which enters at r' . The current is regulated by valve r'' .

The usual mode of removing the purified middlings out of the machine is by conveyers,
120 which converts a portion of the fractured middlings into flour. The pulverized portion, when the middlings are repurified, are blown into the dust-room and made into a low-grade flour.
125

A hopped bottom adds materially to the working of a machine in producing a result not heretofore obtained with machines using conveyers.

In order to make a machine work successfully, the silk on the screen must be stretched
130 perfectly tight. If it sags the middlings will not travel, but pile up on the cloth, which causes the fluff and specks to sift through. It

matters not how tight the silk has been stretched when first put on, in a short time it will become loose. If put on with tacks it requires about half a day to take it off and replace it. When the silk is first put on it has to be stretched every few days. Consequently the necessity of a device whereby the cloth can be stretched in a few minutes. The device for tightening the cloth, as shown in Figs. 1 and 6, fully meets the desired requirements. The silk is first fastened to the clamps by rods *b''*. The clamps *b b*, when fastened to the cross-pieces of the shaker by bolts *b'' b''*, hold the cloth endwise together. In Fig. 2 the rods *c* and bolts *c''*, when operated on by the nuts *c'''* and bolts *c''*, stretches the cloth sidewise perfectly tight and requires only a few minutes to tighten the cloth at any time.

In order to secure a perfect separation of the impurities from the middlings, a great deal depends on the application of the wind. In a suction-machine the fan is usually placed on top over the screen, with openings in the sides of the machine under the screen for the air to enter. The air that enters at the side openings always travels from that point in a direct line to the opening on top in the fan; consequently the middlings on the center of the screen are not acted upon by the air. At the tail of the machine it requires a very strong current to carry off the heavy impurities. In order to obtain satisfactory results the wind must enter in a sheet at the tail end, under the silk, the entire width of the screen. The opening *r* through which the tailings escape prevents the air from entering at the tail end. In Fig. 3, Sheet 2, the application of tubes *d d*, inserted in the tail of the screen and passing from the outside to the inside of the machine through the opening *r*, allows the air to enter without disturbing the descending tailings, thereby securing a result not heretofore obtained.

The removal of the fiber by a suction-machine depends on the quantity of air drawn through the cloth. If the screen is heavily loaded, and a sufficient quantity of air is forced through the middlings to remove the fiber, it also carries off the fine middlings, which are wasted or converted into a low-grade flour. The only satisfactory result yet obtained is the combination of a blast and suction fans. The blast-fan *M* is placed at the tail. The air from it is divided by a spreader, *n*, and fills the wind-chamber *L L*, and is forced through into the chamber *I*, through the side openings *h* and *h'*, forming transverse currents with the heaviest pressure at the head. The heavier the screen is loaded, the greater the pressure. The pressure must be of sufficient force to prevent the fluff from sifting through with the middlings; but not of such force as to prevent the fine middlings from passing through. As the middlings travel over the screen they sift through and unload the screen. Conse-

quently toward the tail end the escape for the air increases, and as it is forced through the thin covering of middlings, it carries off the fluffy material brought on top by the precipitation of the heavy to the bottom and the light on top, produced by the percussive movement of the screen-frame. The suction-fan *O*, being placed over the opening *n''* at the tail of the machine, draws away the dust-laden air raised up by fan *M*, and receives an additional supply of air through the tubes *d d*, which operates on the coarse middlings as they approach the tail of the screen. The operation of the suction is such it does not act on the first half of the screen, but principally on the heavy or coarse middlings and tailings.

The action of the air on the pieces of bran with middlings attached is very effectual. It lifts them up from off the screen sufficiently to carry them over the tail, thereby securing a perfect separation of the worthless material from the good without any waste in the offal.

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

1. The combination, in a middlings-purifier, of the shaker *C*, the side bars, *F*, and bolts *H*, and a series of interrupted or open brushes, *E E E*, having extension ends adapted to slide on said bars and operate successively upon different parts of the upper surface of said shaker, substantially as described.

2. The combination, in a middlings-purifier, of suction-fan *O*, the casing and inner walls forming the space *S*, the shaker *C*, graded silk *D*, feed-trough *B*, and tubes *d*, arranged for partially supplying suction-fan *O* with air, substantially as described.

3. The combination, in a middlings-purifier, of the shaker *C*, sectional graded silk *D*, having looped sides *c*, clamps *b*, with the silk fastened to them, bolts for fastening them to the cross-section of the frame, rods *c*, and bolts *c''*, for stretching the silk sidewise, substantially as described.

4. The combination of the shaker-frame *C*, suction-fan *O*, blast-fan *M*, compartment *I*, and parallel wind-receptacles *L L*, and transverse openings *h h'*, substantially as described.

5. The combination, in a middlings-purifier, of the shaker *C*, blast-fan *M*, suction-fan *O*, hoppers compartment *I*, with discharge-openings *J J' J''*, and chute *N*, substantially as described.

6. The combination, in a middlings-purifier, of the shaker *C*, a series of interrupted or open brushes, *E E E*, tubes *d*, feed-hopper *B*, fans *M* and *O*, hoppers compartment *I*, with discharge-openings *J J' J''*, chute *N*, and silk *D*, substantially as described.

ANDREW HUNTER.

Witnesses:

E. C. BAXTER,
ERNST KUEHNE.