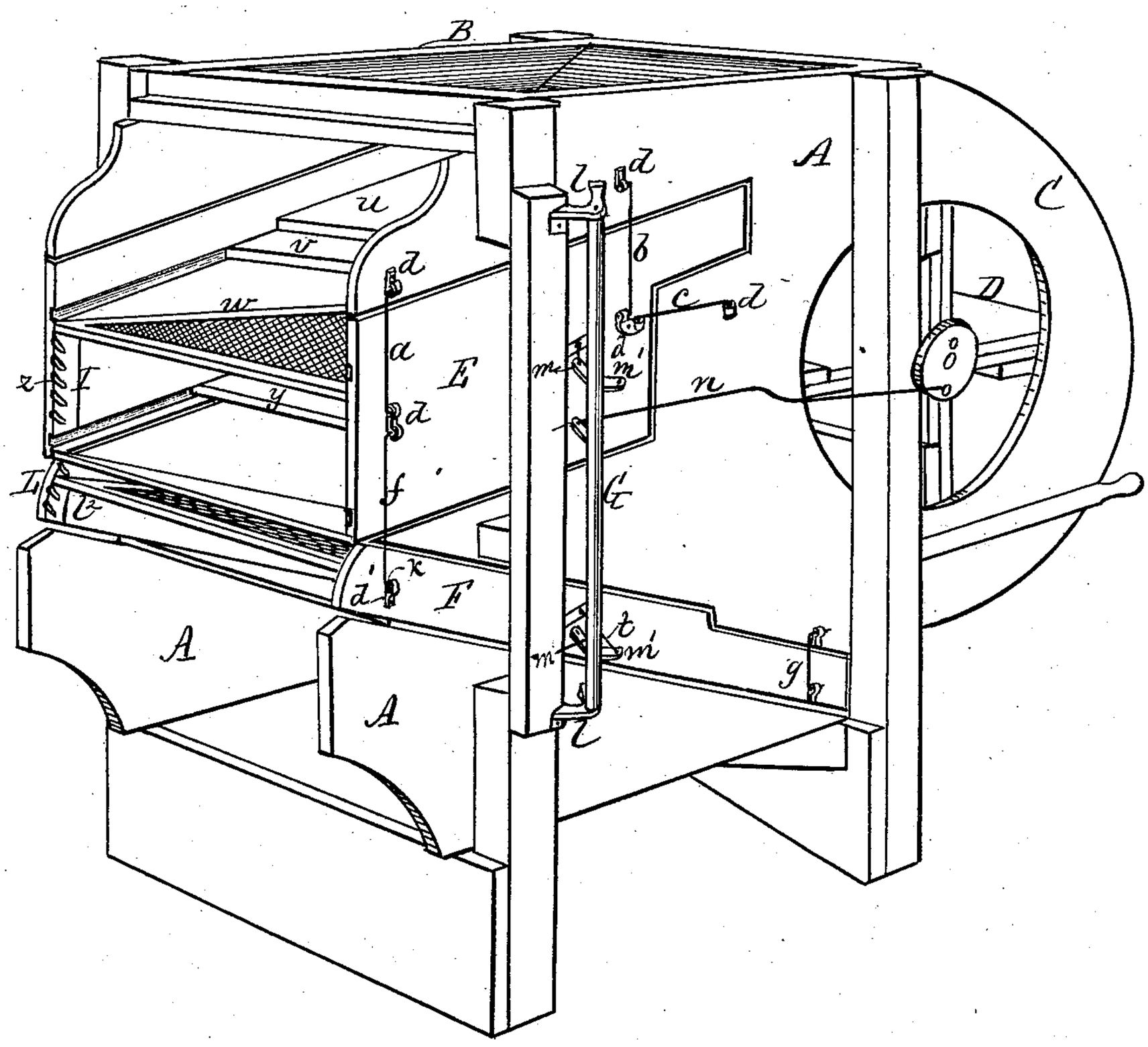
(No Model.) 3 Sheets—Sheet 1.

J. A. KRAKE.

GRAIN SEPARATOR.

No. 255,435. Patented Mar. 28, 1882.

Fig. 1.



Attest.

Wm. G. C. Kilhoffer

P. C. Dunning

Inventor.

John A. Krake

by W. T. Miller

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(No Model.) 3 Sheets—Sheet 2.

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GRAIN SEPARATOR.

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Fig. 2.

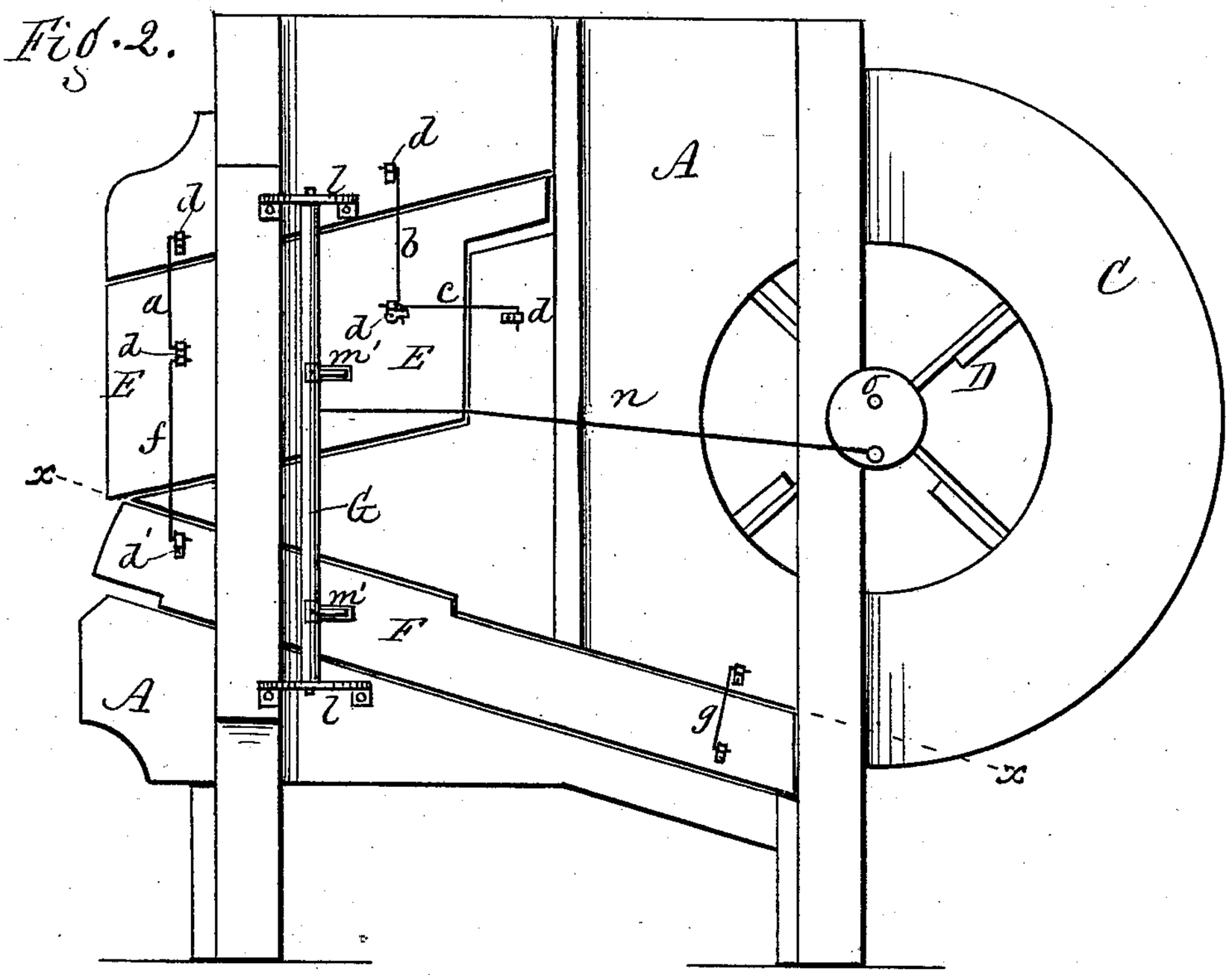
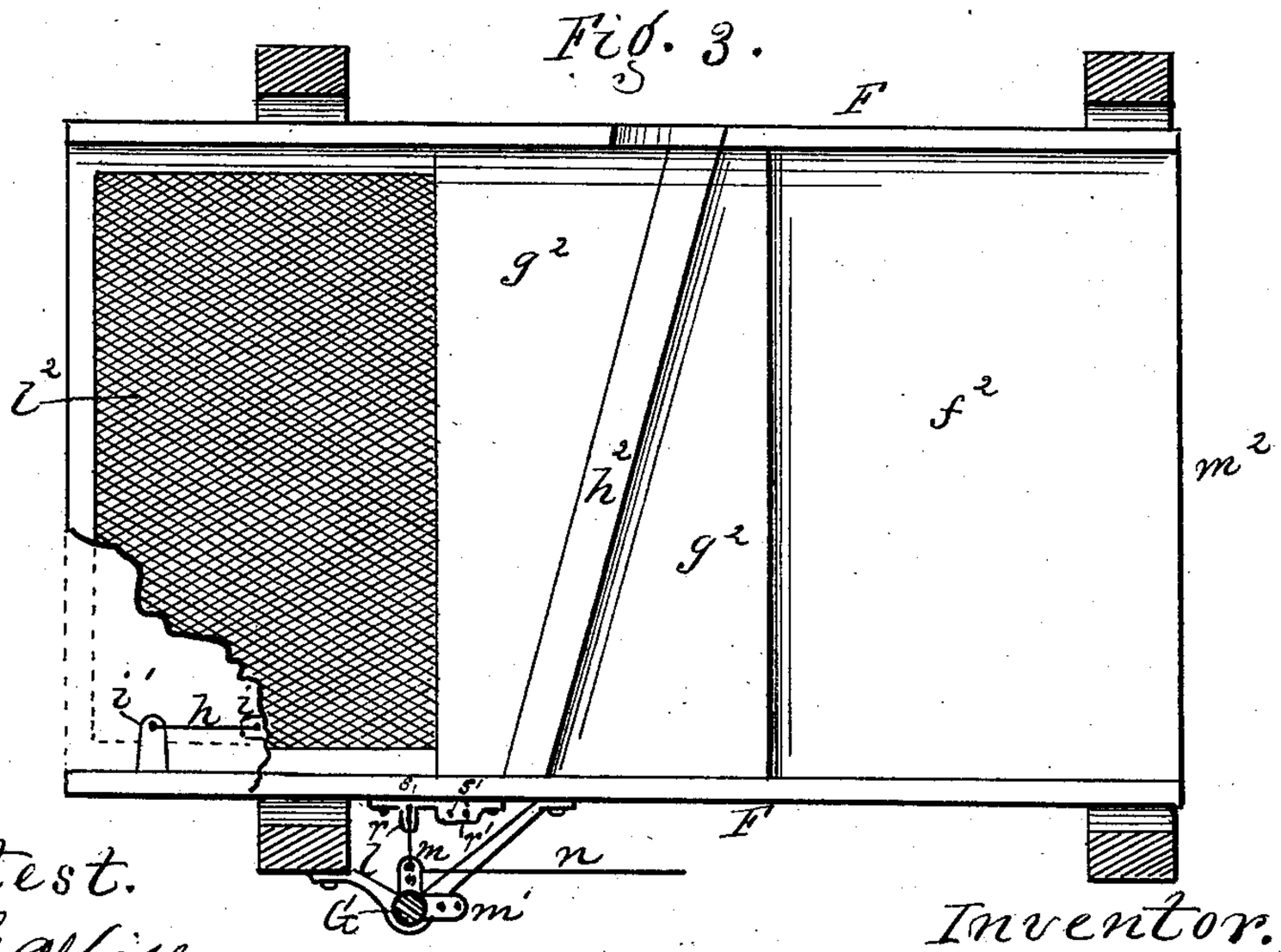


Fig. 3.



Attest.
Wm. G. Kithoffer
P. C. Dunning

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Atty

(No Model.)

3 Sheets—Sheet 3.

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GRAIN SEPARATOR.

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Fig. 4.

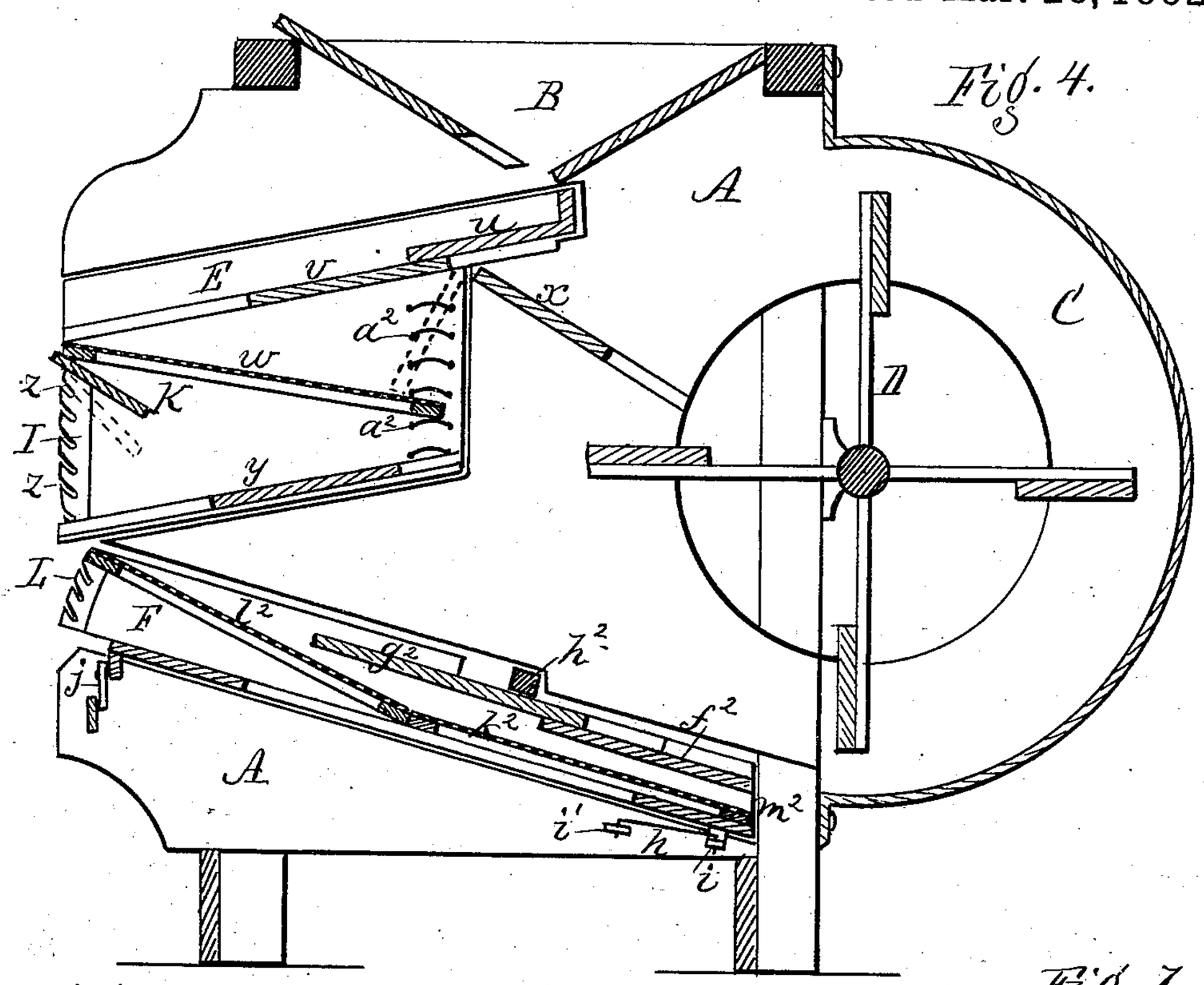


Fig. 5.

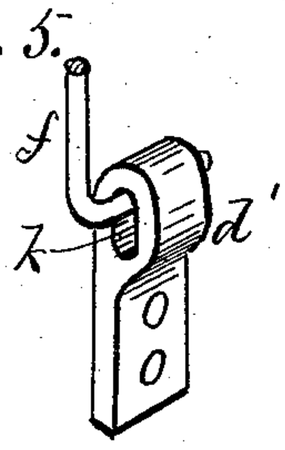


Fig. 6.

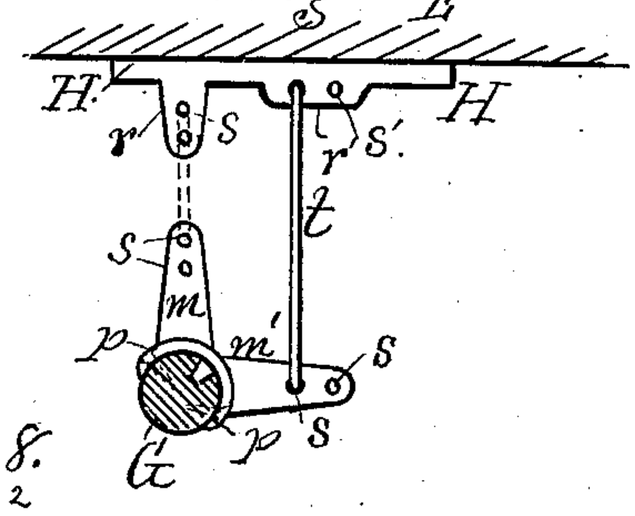


Fig. 7.

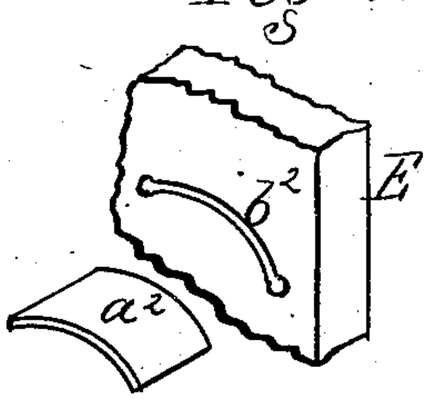


Fig. 8.

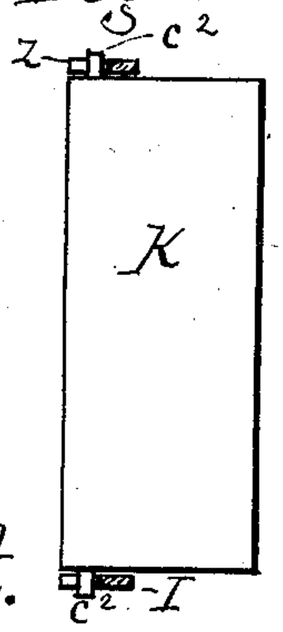
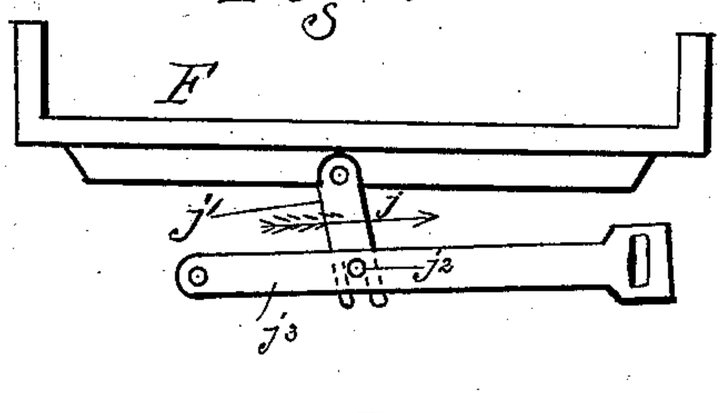


Fig. 9.



Attest.
Wm. C. Kilhoffer
P. C. Dunning

Inventor:
John A Krake
by W T Mellen
Atty

UNITED STATES PATENT OFFICE.

JOHN A. KRAKE, OF BUFFALO, NEW YORK, ASSIGNOR TO WM. F. MILLER, OF SAME PLACE.

GRAIN-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 255,435, dated March 28, 1882.

Application filed June 16, 1881. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. KRAKE, of Buffalo, Erie county, New York, have invented certain new and useful Improvements in Grain-Separators; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of the machine. Fig. 2 is a side elevation. Fig. 3 is a plan of the lower shoe on an enlarged scale, looking downward from line *x x* of Fig. 2. Fig. 4 is a longitudinal vertical section. Figs. 5, 6, 7, 8, and 9 are detail views.

My improvement relates to grain-separators in which two shoes are employed, suspended by hangers at the sides of the mill in such a manner that a compound vertical transverse and longitudinal motion is produced that is effective in separating the grain.

The invention consists in the construction and arrangement of parts, hereinafter more fully described and definitely claimed.

In the drawings, A represents the casing of the mill. B is the hopper, C the fan-case, and D the fan, all of ordinary construction.

E and F are two shoes suspended in the mill, but set at reverse angles, as shown. The upper shoe, E, is suspended from the opposite sides of the mill by hangers *a b*, one pair on each side, said hangers being of unequal length, the rear ones, *a*, being the shortest. By this means a short vertical throw is given to the rear end of the shoe, which serves to toss the grain and loosen it up, preventing clogging. At the inner end the upper shoe is also connected with the sides of the mill by two pivoted links, *c c*, one on each side. The hangers and the links have their ends resting in suitable bearings, *d d d d*, by which the proper joint motion is allowed. When the shoe is at rest the hangers hang vertically and the links stand horizontally, and it will be seen that when the shoe is vibrated transversely the hangers will pass the dead-center in opposite directions, producing vertical, as well as transverse, motion to the shoe, and the links will also pass the dead-center in opposite directions, thereby producing a slight longitudinal motion to the shoe at each vibration. A compound transverse vertical and longitudinal motion is thus given to the upper shoe, which is effective in stirring up, loosening, and spreading the grain, so that the best effect of the blast will be secured.

The lower shoe, F, is suspended by hangers *f g*, two on each side. The rear hangers, *f*, are suspended from the rear end of the upper shoe, while the front ones, *g*, are suspended from the side of the mill. On the under side the lower shoe has on the two opposite sides horizontal links *h h*, pivoted at one end to lugs *i i*, attached to the under side of the shoe, and at the other end to lugs *i' i'*, attached to the sides of the mill, as shown most clearly in Figs. 3 and 4. When the shoe is at rest these hangers and links also stand centered, and when in motion they pass each side of the dead-center, producing the same combined vertical transverse and longitudinal motion to the under as to the upper shoe. In addition to this the rear end of the lower shoe partakes of the motions of the upper one by reason of the rear hangers being suspended from the upper shoe, so that the lower shoe has a rapid vibratory movement in many different directions, which spreads and distributes the grain very evenly.

j is a jolter under the rear end of the lower shoe, similar to that described and shown in my patent of January 4, 1881, No. 236,340. The jolter in that patent is composed of (referring to Fig. 9 of the present drawings) an arm, *j'*, secured to the shoe, and having its lower end forked, so as to straddle and vibrate upon a pin, j^2, on the bar j^3. This bar is adjustably secured to the casing, and the arm *j'* at each vibration of the lower shoe raises the latter slightly, thereby stirring up the grain and preventing clogging. To allow this action to take place the lower bearings, *d'*, in which the ends of the hangers *f* rest, have elongated slots *k*, Fig. 5. The upper bearings of the same hangers may be slotted, instead of the lower ones, if desired. If these slots in the bearings were not provided, the jolter could not be used.

G is a vertical rock-shaft on one side of the mill, and offset or set out at some distance therefrom, resting in brackets *l l* above, and below the shoes *m m'* are two pairs of right-

angled arms standing out from the rock-shaft opposite the shoes. The rock-shaft is also provided with a single arm, with which connects the pitman *n*, that extends to the crank-wheel *o* on the shaft of the fan, and by which the rock-shaft is operated. The arms *m m'* have a half-collar or socket, *p*, which embraces the rock-shaft, and a pin on the inner side, which enters a hole in the rock-shaft, and the collar is secured to the rock-shaft by means of screws.

H H are two blocks or bearings secured respectively to the sides of the two shoes opposite the right-angled arms *m m'*, as shown most clearly in Fig. 6. Each of these blocks has a lug, *r*, projecting out at right angles to the side of the mill, and in line with the transverse arm *m*, and a second lug, *r'*, standing parallel with the side of the mill and opposite the arm *m'*. Each of the lugs and each of the arms has two coincident holes, *s s'*. Either arm can be connected with its lug by a connecting-rod, *t*. In the drawings the longitudinal arm is shown connected with its lug by a connecting-rod attached in the inner holes. A long stroke is given by this connection. A still longer one is given by attaching the connecting-rod in the outer holes. A single motion forward and back only is given by this connection, and it is slow. A more rapid vibration may be given by disconnecting this rod and applying a short one to the transverse arm *m* and its lug *r*, in which case the vibration is short and quick, and a double vibration of the shoe is produced with a single vibration of the arm, owing to the arm passing on opposite sides of the dead-center. By changing the short connecting-rod to the different holes in its arm and lug the length of stroke may be changed. By the means above described a variety of shake-motions may be given the shoes by a single rock-shaft and a pitman connecting the rock-shaft with the crank-wheel in the ordinary way, thereby adapting the motions of the shoes to the kind or condition of the material which is being acted upon.

u is a fixed discharge-board at the upper end of the upper shoe, and *v* is a sliding discharge-board beneath it.

w is a screen which receives the grain from the discharge-boards and conveys it back to the inner end of the shoe, at which point it drops to the shoe below.

x is a directing-board in the mill, which throws the blast up between the screen and the discharge-boards.

y is a sliding discharge-board beneath the screen *w*, which throws the material which falls onto it from the screen to the head of the lower shoe. The grain which falls over the tail of screen *w* falls on a dividing-board on the lower shoe, which will presently be described.

I is a metallic strap on each side of the rear end of the upper shoe, in which are a series of inclined hooks, *z z*, formed by slotting the outer edge of the strap, the hooks inclining downward and inward, as shown in Figs. 1 and 4. The end of the screen *w* has pins which catch upon the hooks, by which the rear end of the screen is supported and made adjustable to any height.

a^2 a^2 are projecting metallic lugs set into slots b^2 b^2 in the sides of the upper shoe and supporting the inner end of the screen *w*. The slots in the sides of the shoe are formed by first boring small holes at the right distance apart, then inserting a small saw in one of the holes and sawing through to the other in a regular curve, the kerf thus made forming the seat for the metallic lug, which is inserted endwise into it. The lug is convex in cross-section, and is made to fit closely in the kerf, and the lugs are placed one above another at regular distance apart, and the inner end of the screen can be adjusted higher or lower by changing from one lug to another. The curved upper sides of the lugs form a smooth bearing for the screen, and allow the latter to be moved easily forward and back without binding or scratching, and also allow the rear end of the screen to be raised and lowered to different positions, still preserving a smooth bearing to the screen upon the lugs. In these respects the lugs are superior to small pins or rods.

K is a deflecting-board, which is hung under the rear end of the screen *w*, and stands down angularly, as shown in Fig. 4. The outer end of the deflecting-board has side projecting pins, c^2 c^2, (see Fig. 8,) which engage with the hooks *z z* of the metallic straps, and by this means the deflecting-board is hung, and maintains its position directly beneath the end of the screen. By inserting the pins one notch lower the board will be made to stand at a different angle, as indicated by the dotted lines, the upper end of the board still preserving a tight joint with the end of the screen. As the end of the screen is adjusted up or down the deflecting-board is adjusted with it. The object of the deflecting-board is to direct a current of air up through the extreme outer end of the screen and at the point where the blast in passing over the screen escapes without reaching the mass of grain on the outer edge. The combination of the deflecting-board with the screen and notched side straps, whereby the board can be held at different angles by the straps, forms one essential feature of my invention.

f^2 is a fixed discharge-board on the front end of the lower shoe.

g^2 is a sliding divider-board above the discharge-board, which can be adjusted forward and back any desired degree.

h^2 is a dividing-bar attached removably to the shoe and extending across the board g^2 in an inclined direction, as shown in the plan view, Fig. 3, its lowest end connecting with a spout-opening through the side of the mill. The board g^2 slides freely under the bar h^2.

k^2 l^2 are two screens, the first resting under the boards f^2 g^2, and the last standing angularly, resting under the rear end of board g^2, and extending to the rear end of the shoe. A

throat is left between the rear end of board g^2 and the screen l^2, for the passage of the grain downward over the surface of the screens. At the front end the discharge-boards and screens have a common discharge at m^2. The two abutting ends of the screens k^2 l^2 fit closely together to make a tight joint.

L is a metallic strap on each side of the rear end of the lower shoe, provided with downwardly and inwardly curved hooks, similar to those on the upper shoe. These straps are curved and concentric with the meeting ends of the two screens. The outer screen, l^2, has pins at its rear end which rest in the hooks, and by pressing the screen down when in place the incline of the hooks causes the meeting edges of the two screens to be pressed firmly together and to be retained in that position.

The operation of this part of my invention is as follows: The grain, as it falls from the inner end of screen w, strikes on the dividing-board g^2, the heavy grain passing downward and forward over the board, and the lighter grain being blown over the rear end of the board onto the screen l^2. The board can be adjusted to make the exact division required. In case it is desired to separate and remove the heavier grain, the bar h^2 is used, as before described, in which case the heavier grain which runs down the dividing-board strikes the bar and runs off to one side.

In case it is not desired to make a separation of the heavier grain, the dividing-bar h^2 is removed, in which case the heavy grain which falls on the dividing-board, and which is free from foul seeds, runs down over the boards to the exit m^2, while the lighter grain which is blown over the dividing-board passes down over the screens k^2 l^2 to the same exit m^2, being freed from the foul seed by sifting. The great advantage of this arrangement is that by running off the heavy and clean grain without passing it over the lower screens a smaller quantity is required to pass over the said screens, and they do not become loaded and clogged, as they would if all the grain passed over them, and the screening action is consequently much better.

If desired, the board K, or some other board, may be placed vertically across the throat between the discharge-board u and screen w of the upper shoe, as indicated by the dotted lines in Fig. 4, in order to shut off the blast above the screen w, and force it through below said screen. This is desirable in separating some kinds of seeds.

Having thus described my invention, I claim—

1. In a grain-separator, the casing, the upper shoe, vertical hangers therefor, and a rock-shaft connected with such shoe, whereby vertical and lateral vibrations are imparted to it, combined with links c, arranged longitudinally of said shoe to cause a longitudinal motion thereof, substantially as shown and described.

2. In a grain-separator, the combination, substantially as shown and described, of the lower shoe, F, its suspension-rods f g, the rock-shaft, and connecting and operating mechanisms, with the horizontal links h h, and their pivotal points i i', whereby said shoe receives transverse vertical and longitudinal movements.

3. In a grain-separator, the combination, substantially as shown and described, of the lower shoe, the suspension-links f, the slotted bearings d' for said links, the links g, a jolter, j, and operating mechanism, as specified.

4. The combination, substantially as shown and described, of the casing A, the upper shoe, E, and the hangers a and b to suspend said shoe in said casing, the lower shoe, F, the hanger f, for connecting the two shoes independently of the freedom of motion of the hanger a, and the hanger g, connecting the lower shoe to the casing, the said hangers a b and f g permitting independent motions to be imparted to the shoes, substantially as specified.

5. In a grain-separator, the combination, with the casing, of the two shoes E F and hangers a b f g, the rear of the lower shoe being suspended from the rear of the upper shoe, the upper shoe being connected with the sides of the mill by pivoted side links, c c, and the lower shoe being connected with the sides of the mill by pivoted links h h, as shown and described, and for the purpose specified.

6. In a grain-separator, the combination, with the suspended shoes E F, of right-angled crank-arms m m', the rock-shaft G, and the bearing-blocks H H, attached to the sides of the shoes, and having lugs r r', for connecting links opposite the respective crank-arms, whereby motion may be communicated to the shoes by either crank-arm when its link is connected, as herein shown and described.

7. In a grain-separator, the combination, with the shoes, of a rock-shaft, G, the crank-arms m m', attached to the rock-shaft, one arm standing at right angles to and the other parallel with the sides of the shoes, and blocks H H, attached to the shoes, provided with lugs, one at right angles to and the other parallel with the sides of the shoes corresponding with the crank-arms, the crank-arms and lugs being provided with holes or sockets for the attachment of connecting-links, as herein shown and described.

8. In a grain-separator, the combination, with the screen w and toothed straps I I, of the deflector K, provided with pins c^2 c^2, resting in the teeth of the straps and adjustable to different angles by raising or lowering in the teeth, as herein shown and described.

9. In a grain-separator, the combination of the stationary discharge-board f^2, the adjustable dividing-board g^2, and the dividing-bar h^2, set in an angular position across the dividing-board, the dividing-board moving freely under the bar, and the bar serving to divide and run off the heavy grain, as shown and described.

10. In a grain-separator, the combination of the discharge-board f^2, the dividing-board

g^2, the dividing-bar h^2, and the two screens k^2 l^2, beneath the boards leading to the same discharge, the abutting ends of the screens being held in close contact, as herein shown and described.

11. In a grain-separator, the combination, in the lower shoe, of the two abutting screens k^2 l^2, the rear one set at an upward angle, side pins therefor, and hooked side straps, L, to receive said pins, whereby the two abutting ends of the screens are kept in close contact, as herein shown and described.

JOHN A. KRAKE.

Witnesses:
W. T. MILLER,
DANIEL MCINTOSH.