

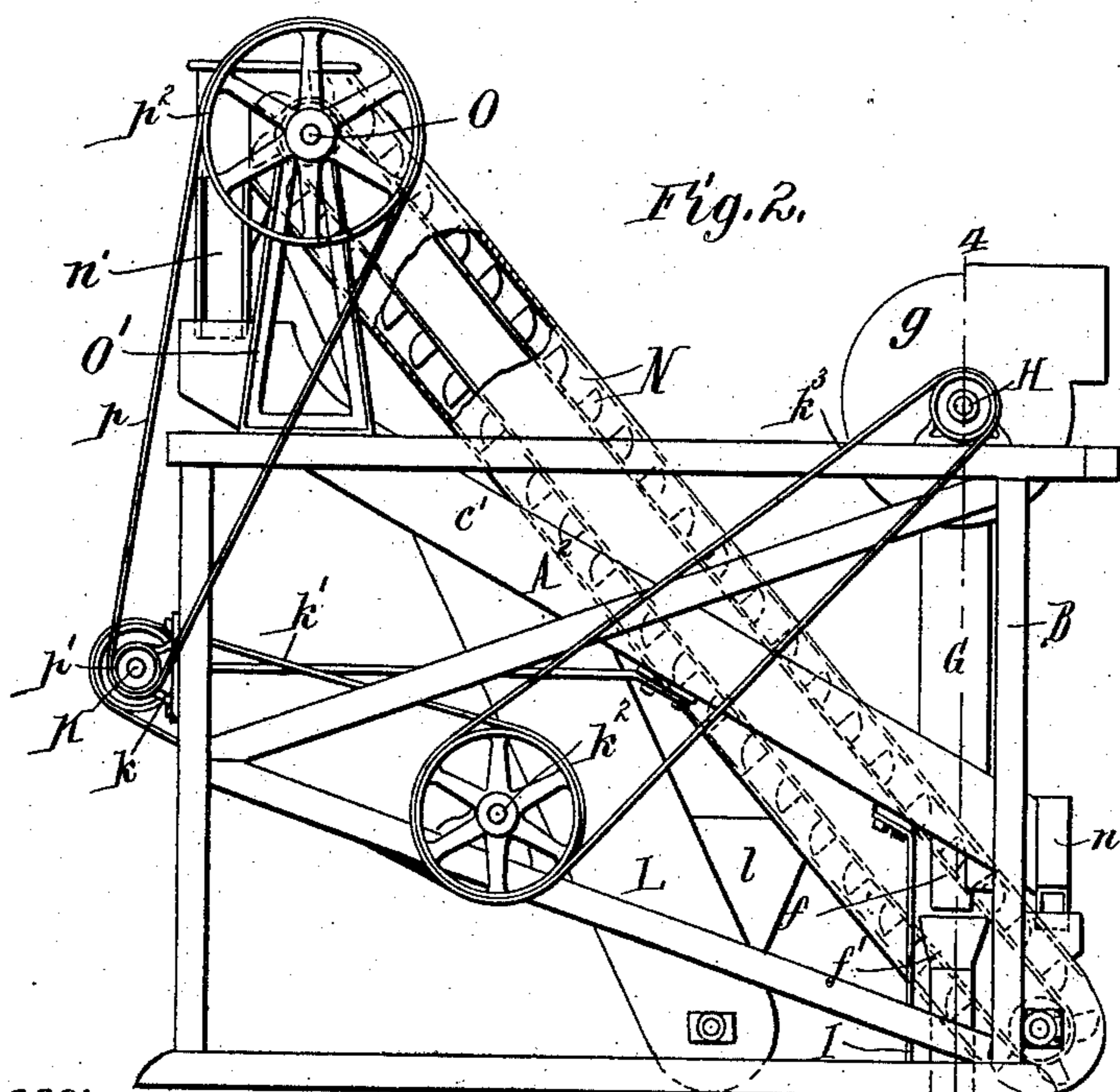
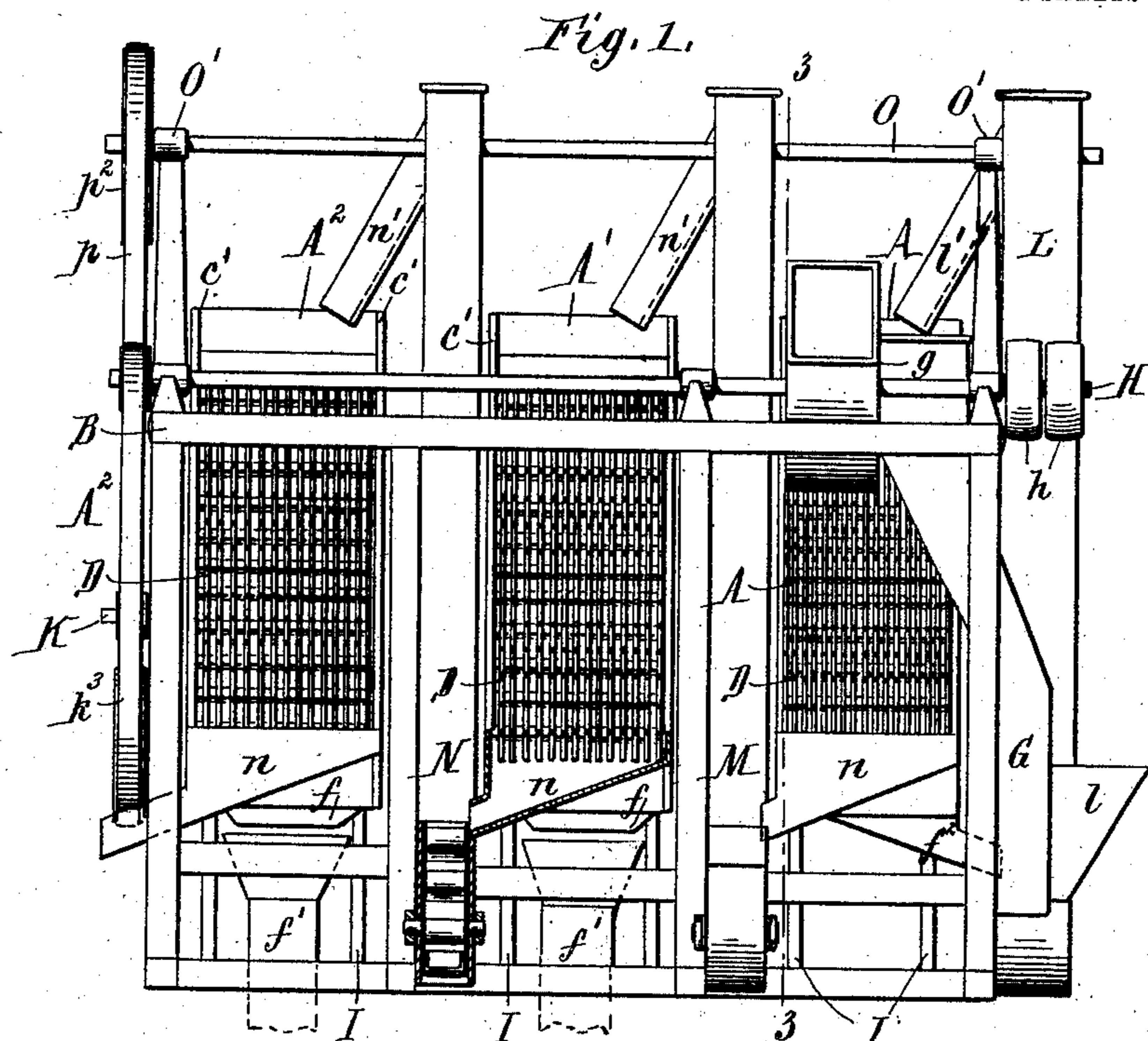
No. 850,447.

PATENTED APR. 16, 1907.

C. F. SHUMAKER.
SEPARATING OR GRADING MACHINE.

APPLICATION FILED NOV. 1, 1905.

2 SHEETS—SHEET 1.



Witnesses:
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E. A. Volk

Inventor:
Charles F. Shumaker,
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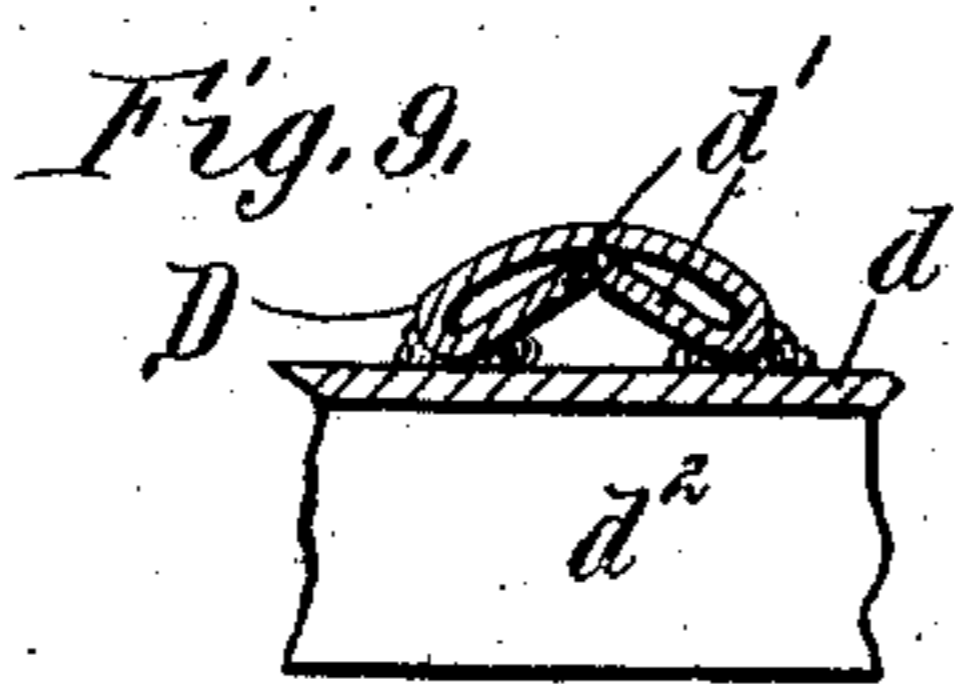
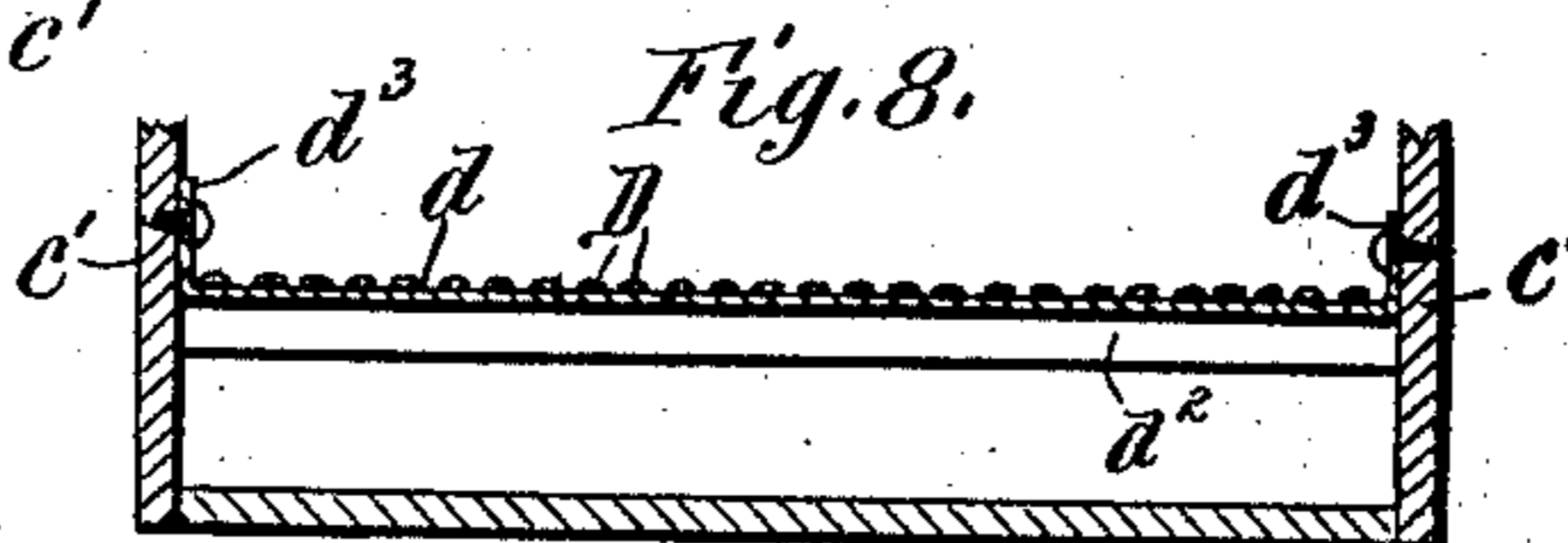
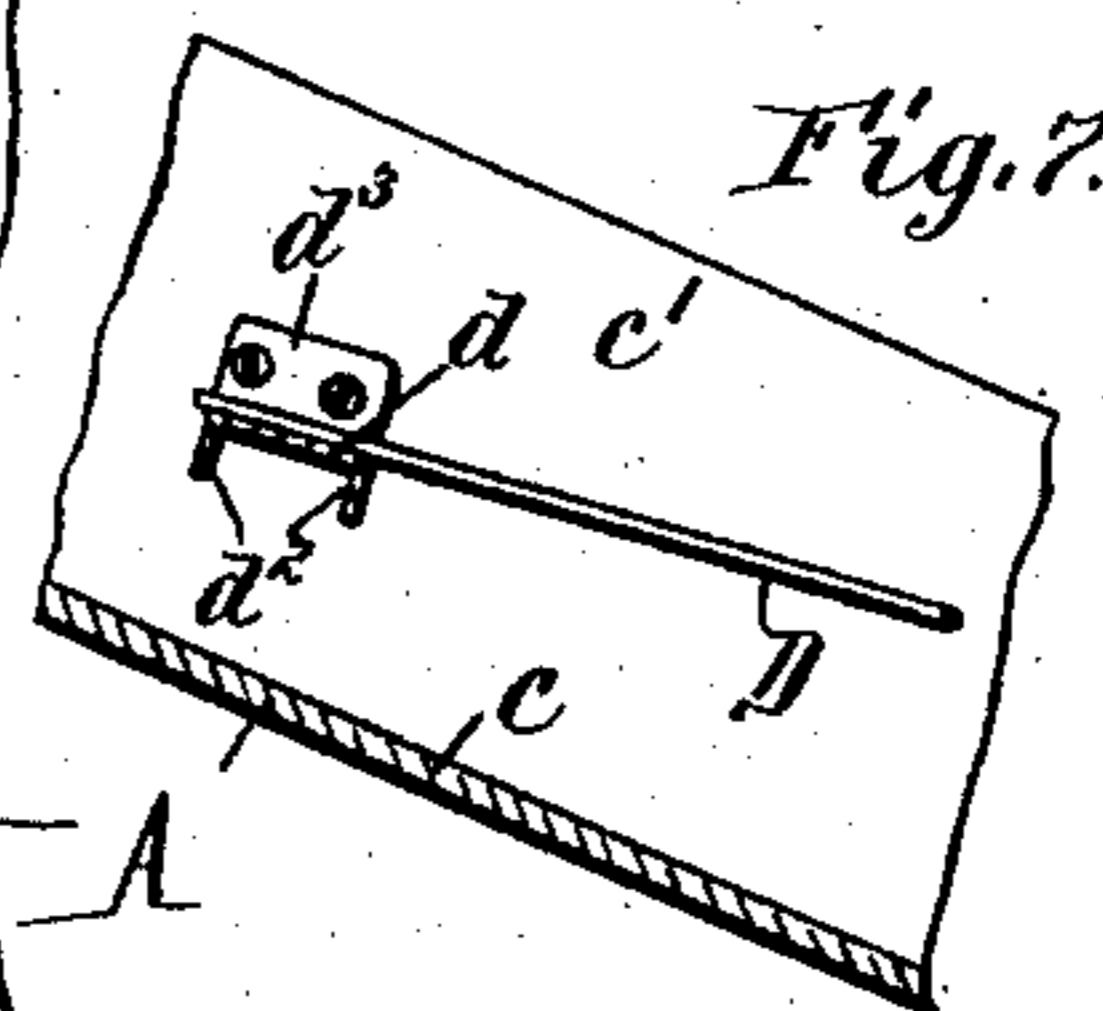
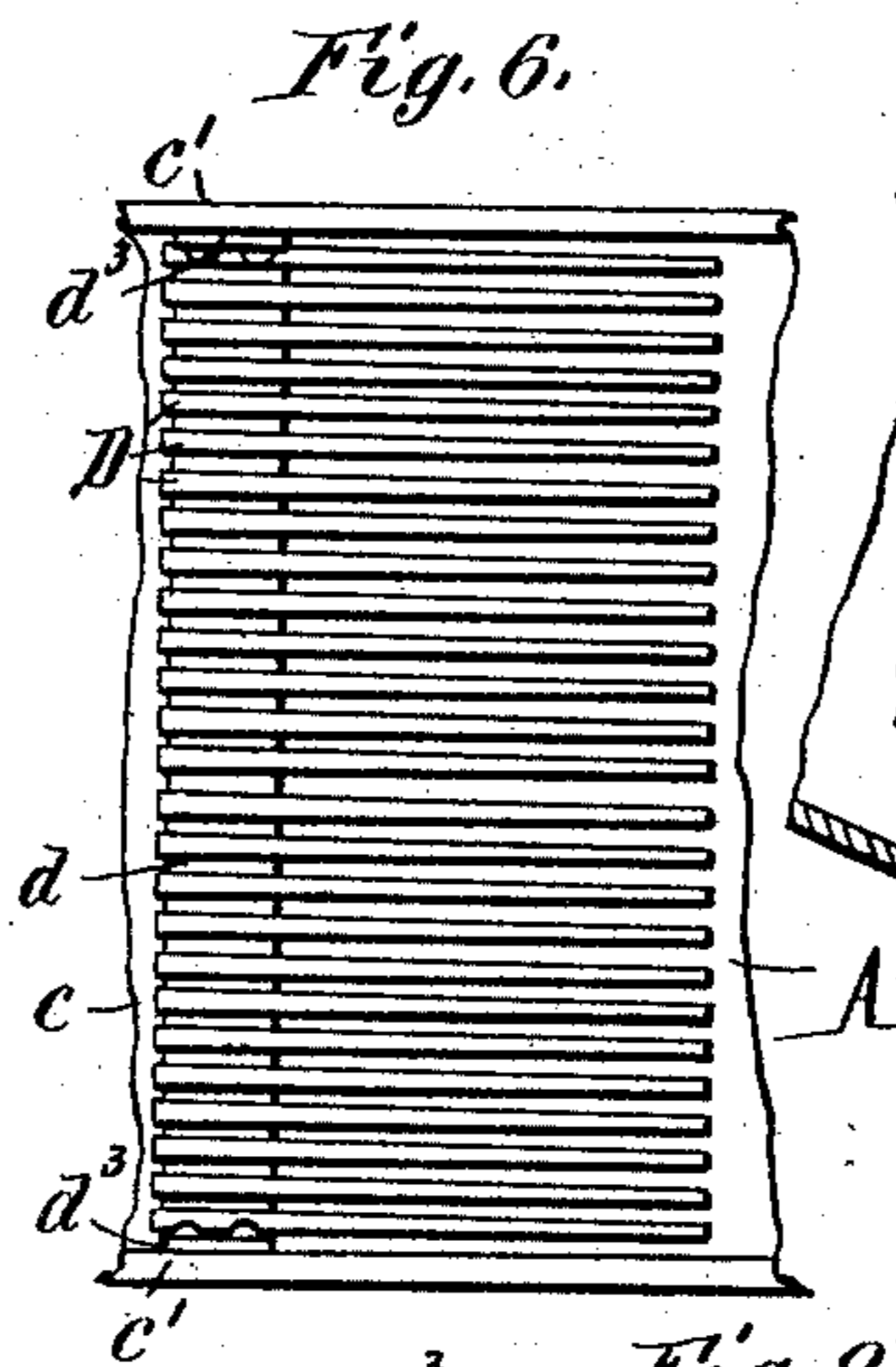
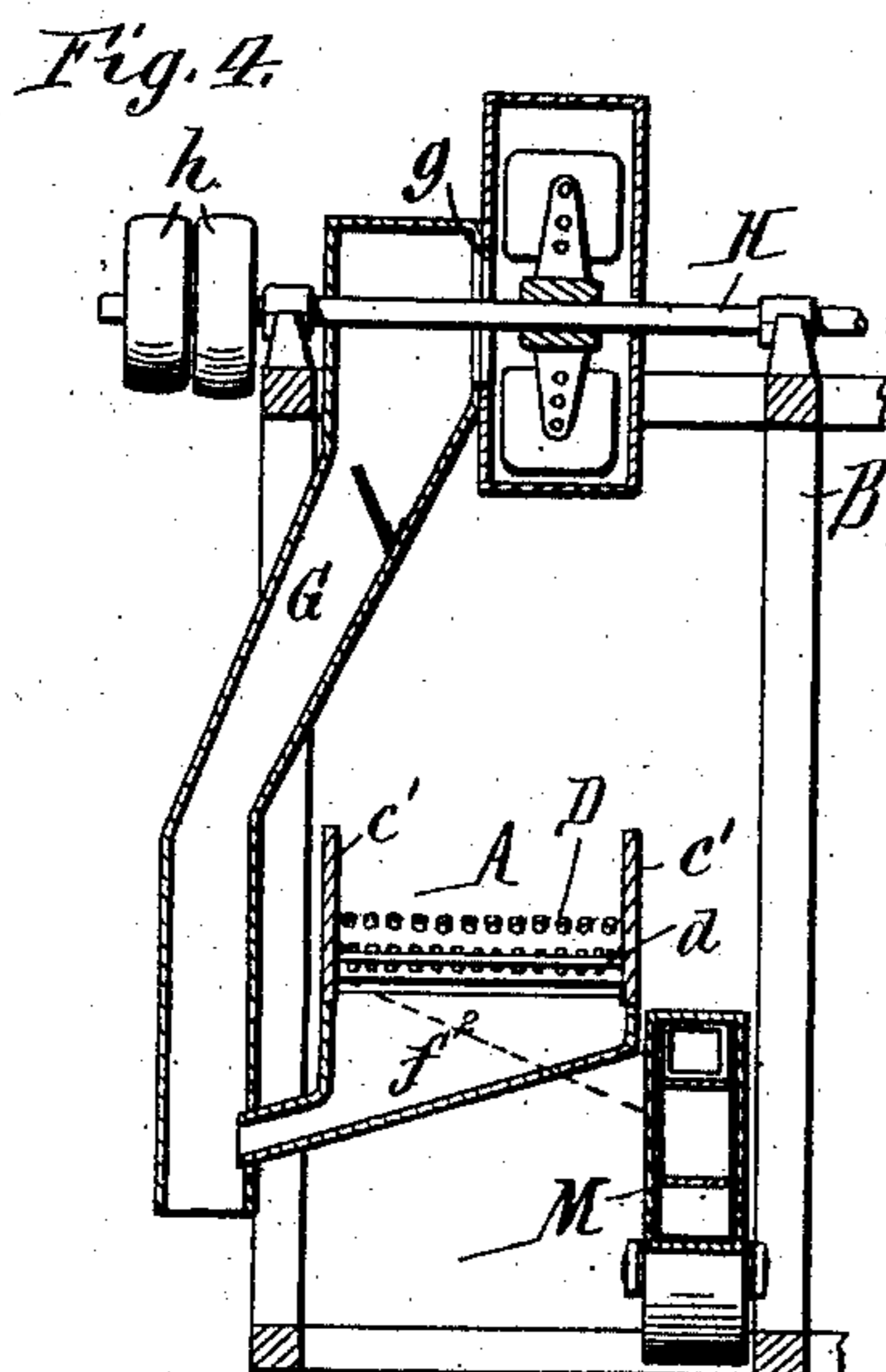
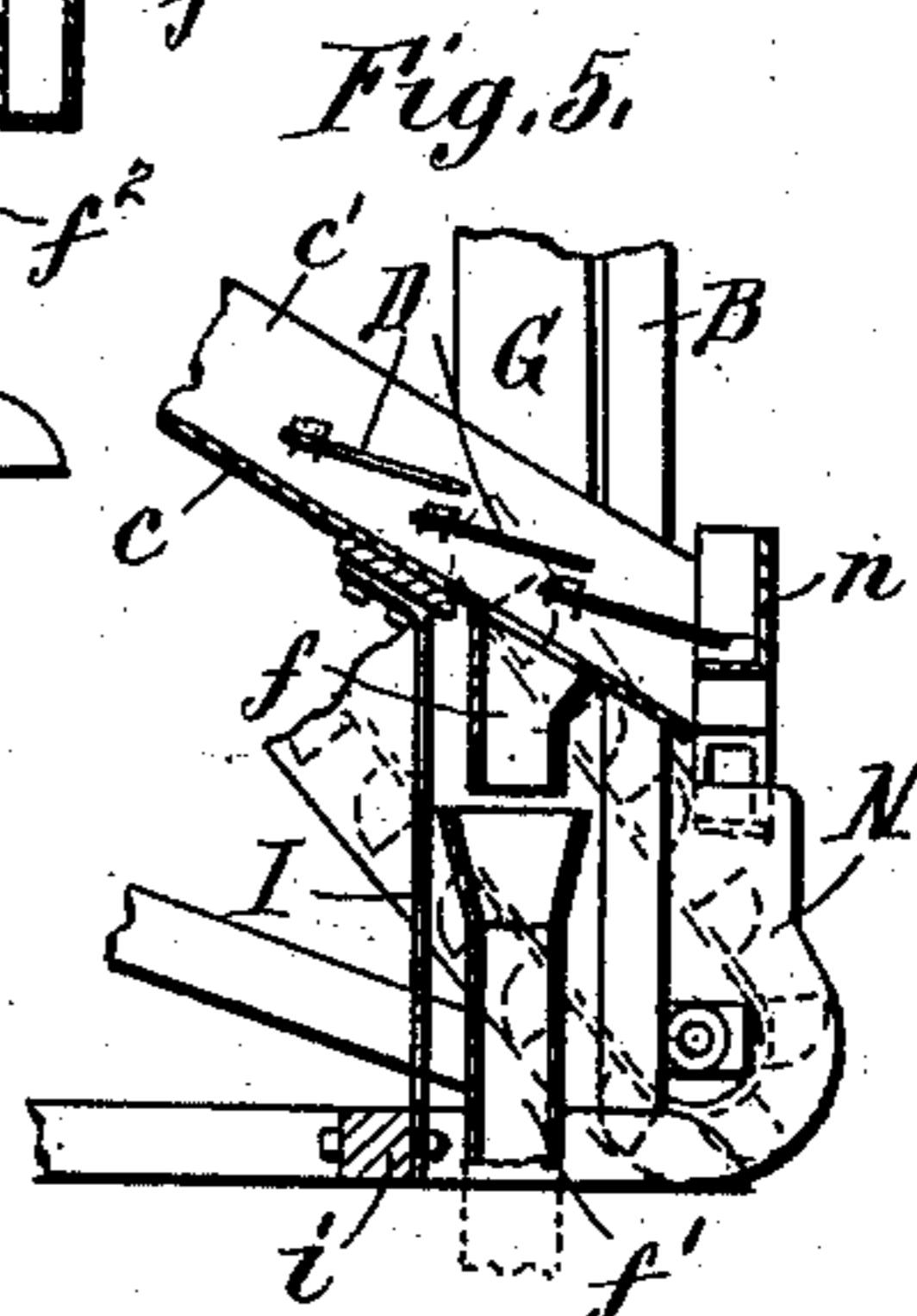
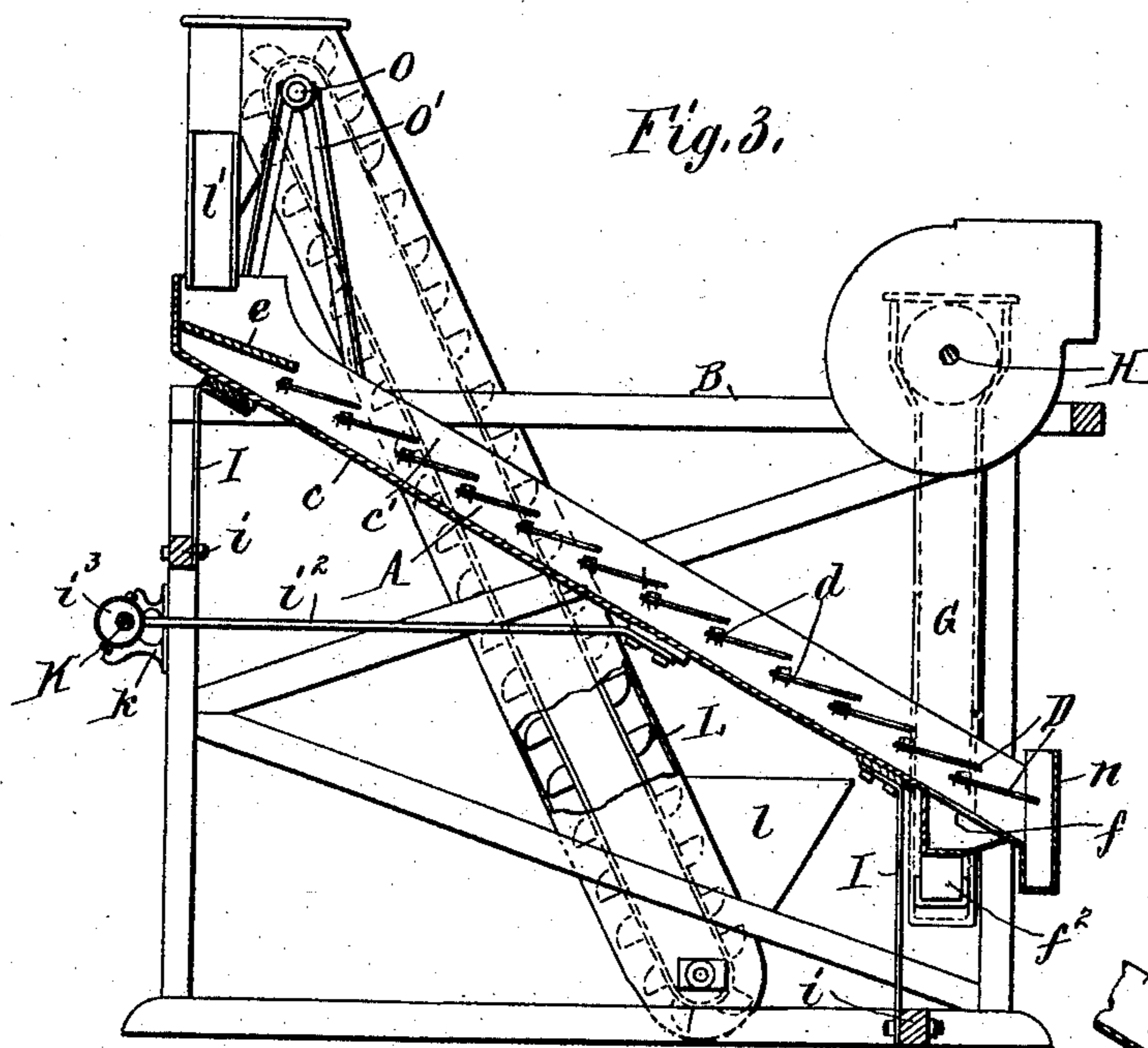
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

CHARLES F. SHUMAKER, OF SILVER CREEK, NEW YORK, ASSIGNOR TO INVINCIBLE GRAIN CLEANER COMPANY, OF SILVER CREEK, NEW YORK.

SEPARATING OR GRADING MACHINE.

No. 850,447.

Specification of Letters Patent.

Patented April 16, 1907.

Application filed November 1, 1905. Serial No. 285,480.

To all whom it may concern:

Be it known that I, CHARLES F. SHUMAKER, a citizen of the United States, residing at Silver Creek, in the county of Chautauqua and State of New York, have invented a new and useful Improvement in Separating or Grading Machines, of which the following is a specification.

This invention relates more particularly to machines for grading or separating green string-beans and other materials of analogous irregular shape into different sizes for canning purposes.

String-beans, owing to their great irregularity and diversity in shape and size and their tendency to mat or mass, are peculiarly difficult to separate into anything like definite grades, and many efforts have been made without success to produce a commercially practical string-bean grader. It has been attempted to separate the beans into three or more grades on a separating-surface in a single shaking-shoe; but to effect a complete grading in a single passage of the beans over the screen it would be necessary to make the shoe of such large proportions as to preclude of its being set up and operated in the ordinary establishment. If, on the other hand, the single-screen separator is made of a size suitable for installation in the ordinary establishment, the separation is so incomplete as to require the beans to be passed and repassed over the screen so many times as to reduce the capacity of the machine below the point of practical utility.

The primary object of this invention is to produce a practical efficient separating-machine especially adapted for grading green string-beans which has a large capacity, while it is of relatively small size and compact, durable, and desirable construction.

Another object of the invention is to provide a finger-screen for such machines of novel and desirable construction.

In the accompanying drawings, consisting of two sheets, Figure 1 is a rear elevation, partly in section, of a separating or grading machine embodying the invention. Fig. 2 is a side elevation thereof. Fig. 3 is a longitudinal sectional elevation thereof in line 3 3, Fig. 1. Fig. 4 is a fragmentary transverse sectional elevation thereof in line 4 4, Fig. 2, looking toward the rear of the machine. Fig. 5 is a fragmentary sectional elevation of the rear end of one of the screens and associated

parts. Fig. 6 is a fragmentary plan view, on an enlarged scale, of one of the shaking-shoes, showing one set of the screen-fingers. Fig. 7 is a longitudinal sectional elevation thereof. Fig. 8 is a transverse section thereof. Fig. 9 is a cross-section, on an enlarged scale, of one of the screen-fingers.

Like letters of reference refer to like parts in the several figures.

The separating or grading machine is composed, briefly stated, of a plurality of inclined longitudinally-shaking screens or separating units arranged side by side in a suitable supporting-frame, with intervening elevators for carrying the material which escapes over the tail end of one screen or separating unit to the head of the next screen for separation upon the latter. Each screen or separating unit comprises an inclined longitudinally-shaking shoe and a separating-surface composed of several sets of longitudinal fingers, said sets of fingers being arranged in a descending series or in stepped order. The fingers in each set are secured at their front ends to and are supported by a cross-bar attached to the shoe, and their rear ends, which are free or unsecured, overhang the attached front ends of the next lower set of fingers. The fingers of the several sets in the same screen or separating unit are spaced alike, so that only one grade is taken from each screen; but the spaces between the screen-fingers increase in width in the successive screens or separating units. The material passing through the spaces between the screen-fingers in one screen is directed by the inclined bottom of the shoe or screen into a suitable hopper or receptacle and constitutes one grade, and the material tailing off of each screen or separating unit is carried to the head of the next screen or separating unit, from which screen a large grade is taken. The material passing through the first screen constitutes the smallest grade, and that tailing off of the last shoe constitutes the largest grade.

The material passing through the first screen is conducted to an air-trunk, in which a current of air is passed through the material to carry off all dust, dirt, and light particles of foreign matter passing through the screen with the material.

A A' A² represent three screens or separating units, which are arranged side by side and are supported so that they can shake or

vibrate longitudinally in a suitable frame or structure B. The several screens or separating units are alike, except as to the spacing of the screen-fingers. Each screen or separating unit comprises an inclined shoe or frame having a solid or imperforate bottom *c* and upright sides *c'* and the separating or screening surface arranged above or spaced from the bottom of the shoe between the sides thereof. The separating or screening surface is composed of screen-fingers D, extending longitudinally of the screen and grouped in several sets arranged in a descending series or in stepped order. (See Fig. 3.) The fingers of each set are secured at their forward ends to and are supported by a cross-bar *d*, connecting the upright sides of the screen shoe or frame. All of the fingers preferably incline downwardly somewhat toward the rear, and the free rear ends of the fingers of one set overhang the attached front ends of the fingers of the next lower set and are located far enough above the fingers of the lower set to prevent beans hanging between them from catching on the lower fingers and clogging the screen. The screen-fingers are preferably formed of strips of sheet metal, having their side edges *d'*, Fig. 9, bent or folded under against the lower side of the central portion of the strip, and the upper surfaces of the fingers are preferably convexed somewhat in cross-section, as shown in said Fig. 9. The fingers thus formed can be made of thin sheet-tin, and while they have the necessary stiffness to retain their shape they are more or less elastic or springy and are much lighter and cheaper than solid metal bars of the required width and are stronger than thin wooden fingers. The edges of the fingers are rounded and smooth, and therefore more easily free the material, and the fingers also taper slightly rearwardly, so that the spaces between them increase gradually in width from front to rear. As a result of this form of the fingers the beans or material which get between the fingers and do not fall through will not stick or wedge, but will be gradually worked rearwardly by the shaking-screen until they fall through the wider portions of the spaces between fingers or pass off of the rear ends of the fingers. The cross-bars *d*, to which the screen-fingers are attached, are also preferably formed of strips of sheet metal having downturned side flanges *d''* to give the bars the necessary rigidity, and the ends of the bar-strips are bent upwardly, forming attaching lugs or ears *d'''*, through which screws or nails are driven to secure the bars to the sides of the screen shoe or frame. The screen-fingers are preferably soldered upon the flat upper surface of the supporting-bar *d*, as the fingers can be more accurately secured this way than by nails, screws, or the like. Each screen frame or shoe in the ma-

chine shown is provided above the upper set of fingers with an imperforate inclined feed board or plate *e*. (See Fig. 3.) The bottom of each screen shoe or frame is provided near the rear or tail end thereof with an opening *f*, and the material which falls through the screen slides down the bottom of the shoe and passes through said opening into a suitable hopper or receptacle. In the machine shown the material falls through the discharge-openings *f* of the second and third screens directly into chutes *f'*, while the material from the first shoe is discharged by a laterally-inclined spout *f''* at the lower end of the shoe into an upright air-trunk G, which is open at its lower end and connects at its upper end with the eye of the casing *g* of a rotary-fan blower. As the material falls through the lower end of the air-trunk G the upward current of air therein, caused by the fan, removes the dust, dirt, leaves, and other light foreign particles from the material. The fan is secured to a shaft H, which is journaled in suitable bearings on the main frame and passes through the fan-casing and is provided at one end with drive-pulleys *h*.

The screen frames or shoes are movably supported and vibrated or shaken in any usual or suitable way. In the machine shown in the drawings each shoe is secured at its front and rear ends to the upper ends of upright flexible supports or springs I, which are fixed at their lower ends to horizontal bars *i* of the main frame, and each shoe or screen-frame is connected by a rod or pitman *i''* and strap to an eccentric *i'''* on a shaft K, which is journaled in suitable bearings *k* on the main frame. The eccentric-shaft K is connected by a belt *k'* and pulleys to a counter-shaft *k''*, Fig. 2, which is journaled on the main frame and in turn is connected to and driven from the fan-shaft by a belt *k'''*, passing around pulleys on said counter and fan shafts.

The beans or material to be separated can be fed to the first screen or separating unit by hand; but preferably an elevator L is provided for carrying the material to the head of the first screen. An incased endless-belt and bucket elevator is shown, and the elevator-casing is provided at its lower end with a hopper *l*. The beans or material are dumped into this hopper and are carried up by the elevating-buckets and discharged through an inclined trough or chute *l'* on the head end of the first screen or separating unit.

M and N represent elevators arranged between the screens or separating units for carrying the material tailing off of one screen to the head of the next screen. Incased endless-belt and bucket elevators, similar to the feed-elevator L for the first screen, are shown. The rear or lower ends of the screen shoes or frames are provided with chutes *n*, which incline laterally and have discharge-spouts

which project over openings in the fronts of the casings of the elevators M N, so as to discharge the material tailing off of these screens into the elevator-casings. Each elevator is provided at its upper end with an inclined spout n' , through which the material falls from the buckets as they pass over the upper belt wheels or pulleys onto the head ends of the screens. The several elevators L, M, and N are preferably driven by a horizontal shaft O, which is supported in suitable bearings O' on the main frame and passes through the upper ends of the elevator-casings and to which the upper belt-wheel of each elevator is secured. The shaft may be driven in any suitable manner—for instance, from the eccentric-shaft—by a belt p , connecting pulley p' p^2 on said eccentric and elevator shafts.

The particular form of elevators for carrying the material to the head ends of screens is immaterial, and different types of conveyers could be employed for this purpose. The conveyers could also be driven by any suitable drive means.

The operation of the machine is as follows: The beans are dumped into the hopper of the first elevator L and are carried by the elevator and to the head of the first shaking-screen A. As the beans pass downwardly over the first screen those which are small enough fall through the spaces between the screen-fingers D onto the bottom of the shoe and escape through the opening f and discharge-spout into and through the air-trunk. These beans form the smallest grade. The other beans which are too large to pass through the first screen escape over the tail end thereof into the chute n and are discharged into the elevator M, which carries them to the head of the next screen, in which the fingers are spaced farther apart. As the beans pass down over this second screen the next larger grade falls through the screen and onto the bottom of the shoe and is discharged through the opening f thereof into the chute below, while the other beans, tailing off of this second screen, are discharged by the chute n at its lower end into the elevator N and carried to the next screen, and so on until the beans have been passed over all of the screens.

The screens when arranged as described can be made of considerable length and given a considerable pitch or inclination without unduly increasing the size of the machine. The machine constructed as described has been found by actual use to have a large capacity and to thoroughly grade or separate green string-beans according to size. While the machine is designed especially for grading green string-beans, it is believed that the machine constructed as shown and described would also be useful for grading other materials of more or less irregular shape.

I claim as my invention—

1. In a grading-machine, the combination

of a plurality of inclined screens arranged side by side, each composed of several sets of longitudinal fingers arranged in stepped order with the free rear ends of the fingers of one set above the attached front ends of the fingers of the next lower set, the fingers being spaced alike in the several sets in the same screen but differently in the different screens, means for shaking said screens in a longitudinal direction, means for collecting the grades of material passing through the different screens, and conveyers for carrying the material escaping from the tail end of one screen to the head end of the next screen, substantially as set forth.

2. In a grading-machine, the combination of a plurality of screens arranged side by side and all inclining in the same direction, each composed of several sets of longitudinal fingers arranged in stepped order with the free rear ends of the fingers of one set above the attached front ends of the fingers of the next lower set, the fingers being spaced alike in the several sets in the same screen but differently in the different screens, means for shaking said screens in a longitudinal direction, means for collecting the grades of material passing through the different screens, and conveyers arranged between said screens and extending upwardly from the tail end of one screen to the head end of the next screen, substantially as set forth.

3. In a grading-machine, the combination of a plurality of screens arranged side by side, each comprising a shoe having an inclined bottom provided at its lower end with a discharge-opening and a screen-surface composed of several sets of longitudinal fingers arranged in stepped order with the free rear ends of the fingers of one set above the attached front ends of the fingers of the next lower set, the fingers being spaced alike in the several sets in the same screen but differently in the different screens, means for shaking said screens in a longitudinal direction, conveyers arranged between said screens extending from the lower end of one screen to the head end of the next screen, and chutes at the lower ends of said screens for directing the material tailing off of one screen into the conveyer for the next screen, substantially as set forth.

4. A screen comprising spaced, sheet-metal fingers having convex upper faces and having their side portions folded under into their concave under sides, whereby folded longitudinal side edges are formed on the fingers, substantially as set forth.

Witness my hand this 28th day of October, 1905.

CHARLES F. SHUMAKER.

Witnesses:

CHARLES N. HOWES,
ELEZIR KEITH.