4 Sheets--Sheet 1.

P. O. BRUNJES & A. BENNECKENDORF.

Machines for Cutting Sugar into Blocks.

No. 141,201. Patented July 29, 1873.

Fig. 2.

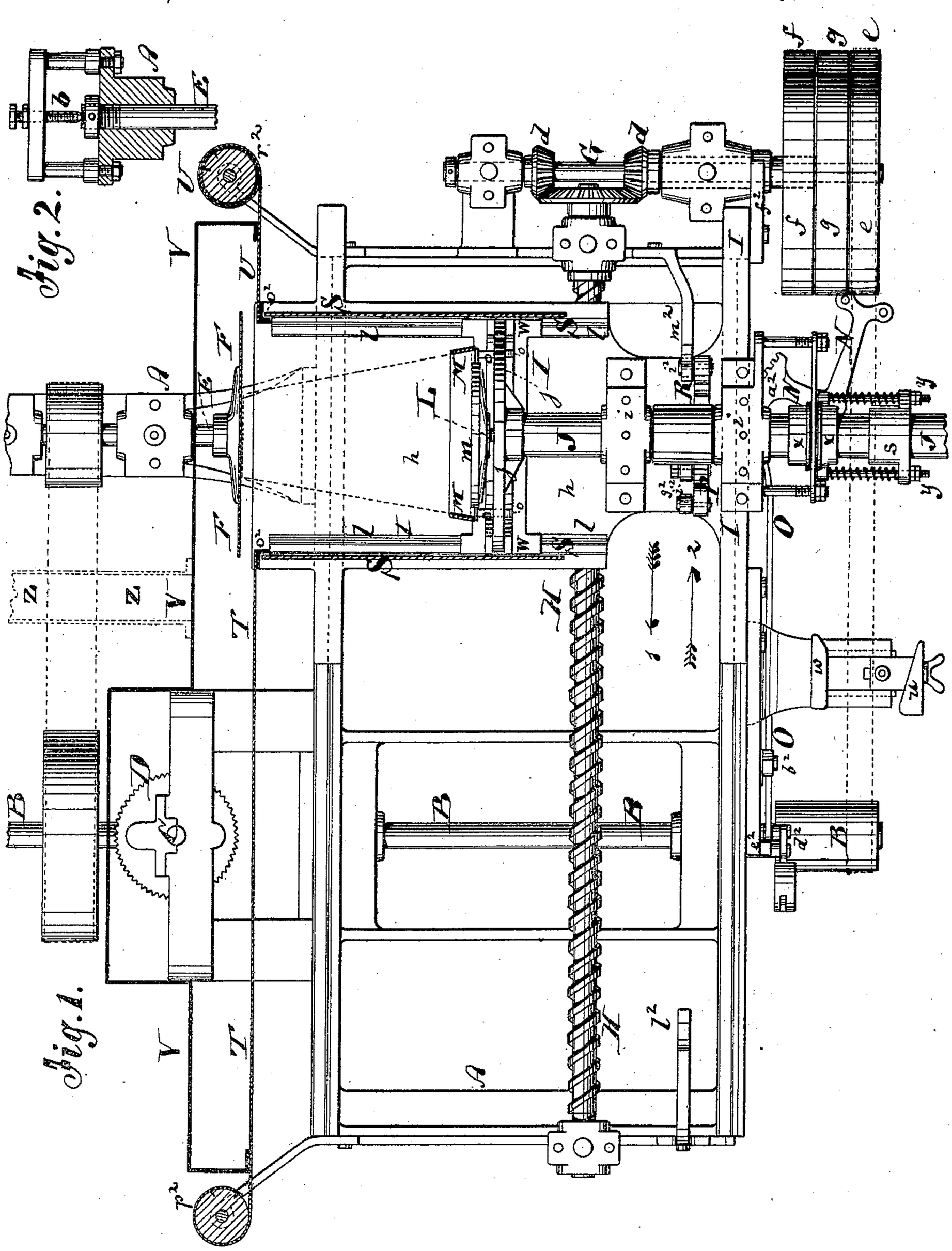

Fig. 1.

Witnesses.

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Fig. 3.

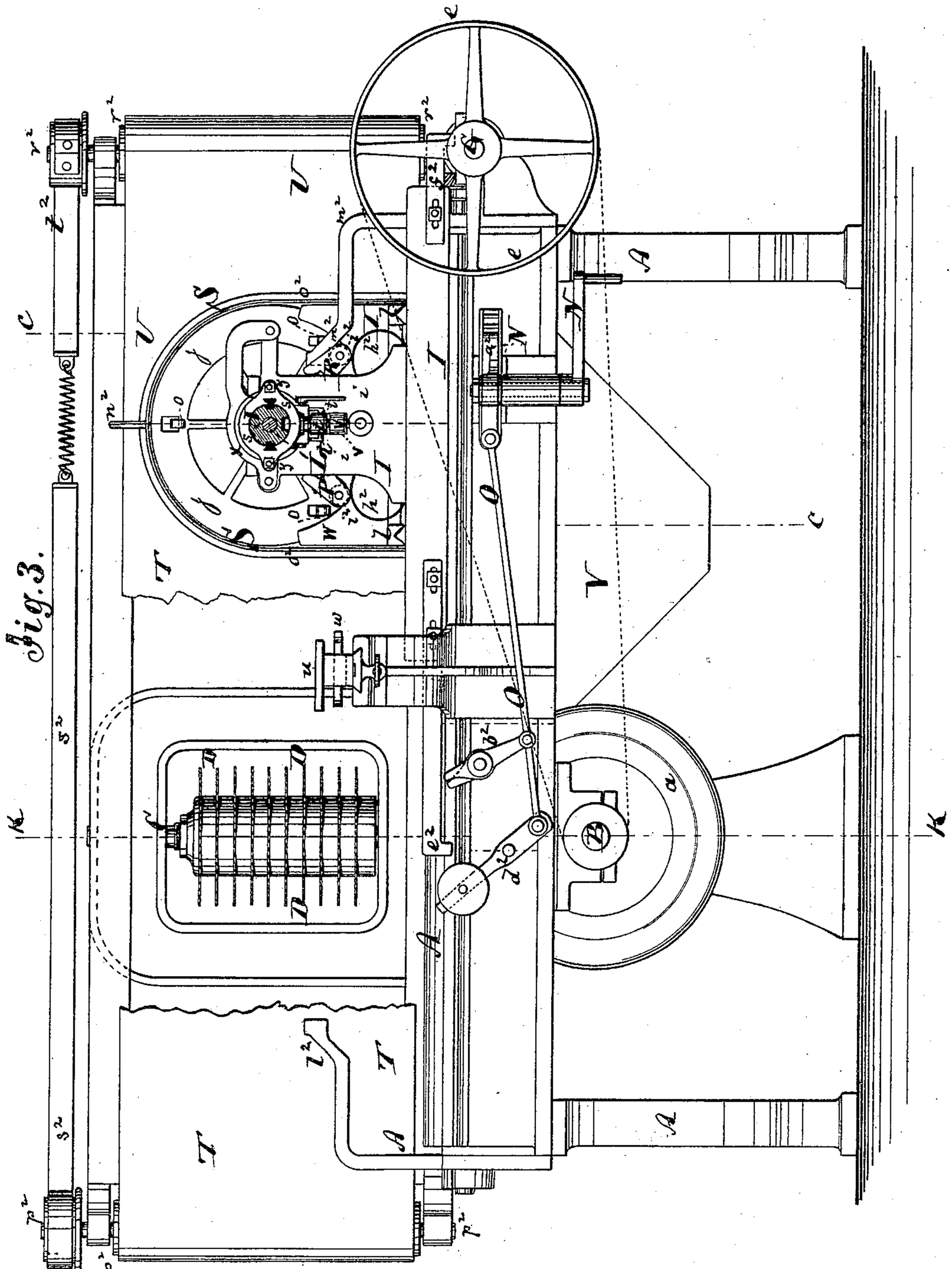

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Fig. 5.

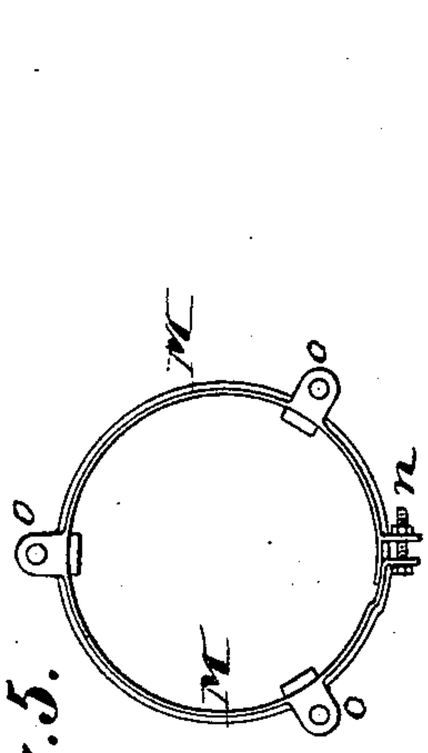

Fig. 4.

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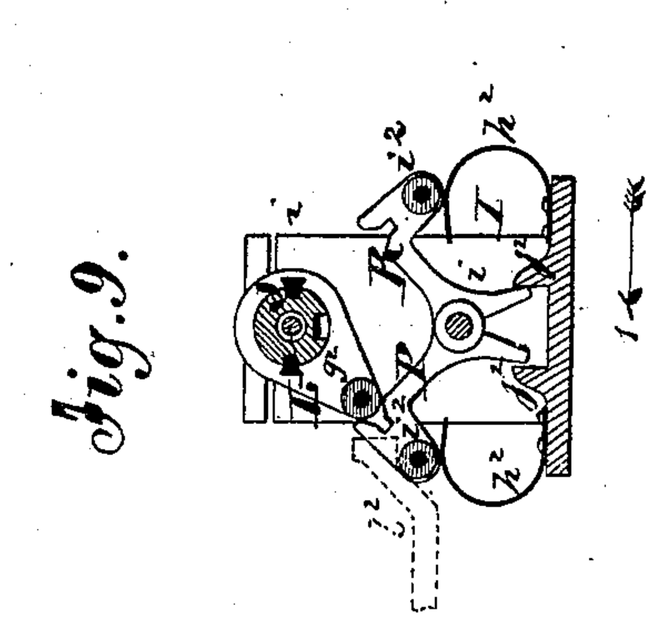

Fig. 9.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

PETER O. BRUNJÉS AND ALBERT BENNECKENDORF, OF HOBOKEN, N. J.

IMPROVEMENT IN MACHINES FOR CUTTING SUGAR INTO BLOCKS.

Specification forming part of Letters Patent No. **141,201**, dated July 29, 1873; application filed June 2, 1873.

To all whom it may concern:

Be it known that we, PETER O. BRUNJÉS and ALBERT BENNECKENDORF, both of the city of Hoboken, in the county of Hudson and State of New Jersey, have invented a new and Improved Machine for Cutting Sugar into Blocks, of which the following is a specification:

This invention relates to several improvements of the machine described in the two Letters Patent granted to us on the 29th October, 1872, and 7th January, 1873, and numbered 132,626 and 134,588, respectively. One principal object of the present invention is to prevent the diffusion of dust during the cutting of the sugar by the saws. In operating our machine we have found that the sugar-dust thrown out by the saws greatly interferes with the proper working of the machinery, and also prevents the attendant from keeping the requisite control over the parts, not only by blinding him, but also by covering the several parts of the machine. To prevent this inconvenience we have connected with the reciprocating carriage in which the sugar is held a curtain, or, rather, a pair of curtains, which are wound upon rollers at the ends of the machine, and which, as the carriage travels back and forth, respectively, are wound upon, and unwound from, their rollers. These curtains form a partition between the saws and the fore part of the machine, and confine the dust in the chamber containing the saws, the carriage being, moreover, covered by a hood, by which the dust immediately around the sugar-loaf is confined to the same chamber. For operating the aforesaid curtains in the proper manner the drums or rollers carrying them are also connected, by bands wound in the opposite direction, to the curtains, so that the unwinding of one curtain, when the same is drawn by the moving carriage, causes the band of its drum to be wound up, the other band, therefore, to be unwound, the other drum, consequently, revolved, and the curtain pertaining thereto wound up. Another object of our present invention is to facilitate the attachment of the sugar-loaf to the holding-disk in the carriage, and to simplify the apparatus for holding the loaf in place. Instead of the more complex devices formerly described we now use a plain metal band, which is placed around the base of the loaf, tightened on the same, and then fastened to the disk or follower of the feed-bar by backwardly-projecting hooks, that enter slots of such disk or follower. In combination with this band we use a cushion or plunger that is attached to a rod passing the center of the now tubular feed-bar, said plunger being, when the loaf has been applied, forced against the base of the loaf, causing it not only to fit tightly into the embracing ring or band, but also to draw such ring forward from the follower sufficient to insure the requisite tightening of the connecting-hooks aforementioned. Our invention also consists in fitting the lower part of the disk or head on the feed-bar into a grooved sliding shoe for the purpose of obtaining greater steadiness of the sugar-holding device. Our present invention, furthermore, consists in using an additional retaining-pawl on the toothed feed-bar, said retaining-pawl being thrown out of gear, by a stationary stop, immediately before the other or feed pawl is acted upon for moving the feed-bar. Finally, our present invention consists in a new mechanism for vibrating the loaf of sugar, and the feed-bar holding the same in the carriage at the end of each stroke of the carriage, so as turn the sugar-loaf at the proper angle to be grooved by the circular saws. In this mechanism a pair of pivoted locking-jaws are employed on the carriage, such jaws holding a projecting crank of a feed-bar sleeve during the motion of the carriage, but so that they will release such crank at the end of each carriage stroke and allow the loaf to be swung at an angle to its former position by suitable fixed stops.

In the accompanying drawing, Figure 1 represents a plan or top view, partly in section, of our improved sugar-cutting machine. Fig. 2 is a detail sectional plan of the outer end of the spindle of the detaching-saw. Fig. 3 is a front elevation, partly in section, of the machine. Fig. 4 is a vertical transverse section taken on the line *c c*, Fig. 3. Fig. 5 is a detail face view of the band that is placed around the base of the sugar-loaf. Fig. 6 is a vertical transverse section of the machine taken on the plane of the line *k k*, Fig. 3. Fig. 7 is a detail vertical section on the line *c k*, Fig. 4.

Figs. 8 and 9 are vertical sections on the line q' q, Fig. 4, showing the tumbling mechanism in different positions.

Similar letters of reference indicate corresponding parts.

The letter A in the drawing represents the supporting-frame of our improved sugar-cutting machine. The same is made of metal or other suitable material, of proper size and strength to support the various parts of the machinery. B is a horizontal transverse driving-shaft hung in the frame A, and receiving rotary motion, with the requisite speed, by suitable mechanism. C is a vertical shaft carrying a series of grooving-saws, D D, and connected by friction-wheels *a*, or otherwise, with the shaft B, so as to receive rotary motion from the same, as is more fully indicated in Fig. 6. By means of a belt, or equivalent mechanism, the shaft B also imparts rotary motion to a horizontal shaft, E, which carries the detaching-saw F, shown in Fig. 1. By reference to Fig. 2 it will be seen that the shaft E may be adjusted lengthwise in its bearings by means of a set-screw, *b*, for the purpose of setting the detaching-saw F at suitable distance from the small end of the sugar-loaf. Another belt from the shaft B imparts rotary motion to a horizontal shaft, G, which is, by bevel-pinions *d d*, in gear with a feed-screw, H, hanging longitudinally and horizontally in the frame A, as clearly shown in Fig. 1. The belt from the shaft B to G passes over a pulley, *e*, to turn the screw H in one direction, and over a pulley, *f*, to turn the said screw in the opposite direction. A loose pulley, *g*, between *e* and *f*, is used for evident purposes. All these parts C, E, and G may, however, receive their rotary motion by other mechanism than that shown; and we do not confine ourselves to the means described for that purpose. I is the carriage for holding and conducting the sugar-loaf across the saws. Its bed-plate *h*, which is more clearly shown in Fig. 4, rests on rails of the frame A, so that the carriage may conveniently move in a longitudinal direction back and forth over such frame A. The screw H passes through a nut that is suspended from the lower part of the carriage I, and serves to impart the desired reciprocating motion to the carriage. In proper standards *i i* of the carriage I is supported the horizontal transverse feed-bar J, which has at that end that is nearest to the saws F D a head or enlargement, *j*. The lower part of this head or enlargement is caused to enter a grooved slide or shoe, W, that rests on the surface of the bed-plate *h*, and, by preference, also on projecting rails *l l* of such bed-plate, as is more clearly indicated in Fig. 7. By this connection with the sliding shoe greater steadiness is given to the motion of the head *j*, and consequently of the entire feed-bar J, although the turning of the feed-bar and its appendages is not thereby prevented. The feed-bar is, in the present case, made tubular, to receive through its center a rod, L, which carries a plunger or plate, *m*, forward of the head *j*—that is to say, between the said head *j* and the saw F—as shown in Fig. 4. The sugar-loaf to be cut is, at its base, embraced by a spring or split ring, M, which is fully shown in Fig. 5, and which, by means of a screw, *n*, or equivalent devices, is properly contracted around the base of the sugar-loaf to firmly embrace and hold the same. The inner periphery of the ring M is beveled or conical, to conform to the outer periphery of the loaf at its base, and thereby to take proper hold of such loaf at every point of the length of such inner periphery of M. Three, more or less, hooks, *o o*, project from the ring M toward the head *j*, and through apertures of such head, as is clearly shown in Fig. 4. By contracting the ring M around the base of the sugar-loaf these hooks are, with their bills, brought against the back surface of the plate *j*, so as to properly connect the ring with such plate. For finally securing the ring M, and holding the loaf of sugar in proper position, the plunger *m* is crowded against the base of the sugar-loaf by screwing the rod L into the tubular feed-bar J. This will also crowd the bills of the hooks *o* against the plate *j*, and insure a very firm and substantial connection of parts; that is, however, much simpler than the sugar-loaf-fastening devices heretofore used. The feed-bar is toothed, as shown in Fig. 4, to be gradually moved forward toward the saws D F, for producing the requisite detachment of sugar from the small end of the loaf. Two pawls, *p* and *r*, engage into the toothed portion of the rack or feed bar, as shown in Fig. 4. The pawl *p* serves as a detent or lock for the feed-bar, to prevent it from being pushed back again after having once been set forward by the working or feeding pawl *r*. The feeding-pawl *r* is pivoted in a sleeve, *s*, that loosely embraces the feed-bar J, and from which a friction-roller, *t*, is suspended. When the carriage is, by the screw H, moved in the direction of the arrow 1, which is shown in Fig. 1, the roller *t* strikes the oblique face of a fixed, but adjustable, cam, *u*, and is thereby moved, with its sleeve *s* and pawl *r*, further toward the saws D F. Such motion of the pawl *r* is, by its connection with the toothed part of the feed-bar J, imparted to the latter, and thereby also to the loaf of sugar. Before, however, the pawl *r* with its appendages can be moved in the manner described, it is necessary to disengage the detent *p* from the rack or feed bar J, as otherwise no motion can be imparted to the latter. For this purpose a friction-roller, *v*, which is suspended from an elbow-lever that connects with the pawl *p*, strikes the oblique edge of a fixed cam, *w*, immediately before the friction-roller *t* is affected in the manner described by the cam *u*. When the friction-roller *v* is thus acted upon by the cam *w* the detent *p* is drawn down and away from the feed-bar J, and the latter thereby left subject to the control and motion of the pawl *r*.

It will be noticed by reference to Fig. 1 that the sleeve *x*, in which the pawl *p* and connection have their bearings, is not movable, but is rigidly connected with a post, *i*, of the carriage I, though capable of turning with the feed-bar J, while on the contrary the sleeve *s*, carrying the pawl *r*, is movable on rods *y y* that extend from the sleeve *x*, and is by springs that embrace such rods *y*, or by other springs, crowded back into its normal position immediately after its friction-roller shall have passed the cam *u*. The pawl *p* is also brought back to its contact to the feed-bar J by a spring that bears against its lower side, and that is fully shown in Fig. 4.

We have now shown that the carriage I, carrying the loaf of sugar, is moved backward and forward longitudinally over the frame A, and that also intermittent longitudinal motion at right angles to the motion of the carriage is imparted to the feed-bar J and to the sugar-loaf which it holds while the carriage moves in the direction of the arrow 1.

It will now be necessary to show how the motion of the screw H is reversed so as to impart the requisite reciprocating motion to the carriage I, and also how the feed-bar J, carrying the sugar-loaf, is tilted or vibrated on its axis so as to insure the grooving of the loaf, by the saws D, at right or other angles. The belt that extends from the shaft B over the pulley *e* of the shaft G is straddled by projecting pins of a lever, N, which lever is pivoted to the frame A. A toothed segment, a^2, formed on such lever, as indicated in Fig. 1, is in gear with a toothed portion of a bar, O, or of a slide connected with such bar. This bar O is by pivots also connected with a tilting link, b^2, and with a weighted bar or lever, d^2, as shown in Fig. 3. The carriage I has projecting stops or arms, e^2 and f^2, respectively, at its opposite ends, as is also shown in Fig. 3. When the carriage is, by the rotation of the screw H, moved in the direction of the arrow 1, it will, at the end of its stroke in such direction, carry the projection f^2 in contact with the tilting arm b^2, and will thereby swing the same into the position shown in Fig. 3, and impart motion to the rod O, which will vibrate the lever N and cause it to carry the belt from the pulley *f* to the pulley *e*, thus reversing the motion of the shaft G and screw H, and causing thereupon the carriage to move back in the direction of the arrow 2, shown in Fig. 1. At the end of the motion in this latter direction the stop e^2 strikes the lever b^2 and swings the same so as to vibrate the lever N and cause the same to return the belt from the pulley *e* to the pulley *f;* in this manner, therefore, the motion of the screw H and carriage I is automatically reversed at the proper times. The weight on the lever d^2 will swing over to the desired side and complete the shipping movement more promptly than the same would have been completed by the direct motion of the carriage. In fact, the weighted lever performs that part of the shipping motion which could no longer be done by the motion of the carriage, as the latter would stop the moment the belt leaves the driving-pulley and reaches the loose pulley *g*, from which loose pulley the weighted lever d^2 removes the belt. g^2, Figs. 8 and 9, is a crank projecting from the feed-bar J—that is to say, its shank or head is made to embrace such feed-bar—and connected therewith by groove and feather, or otherwise, so that the crank and feed-bar must necessarily turn together, while, however, the feed-bar may move longitudinally through the eye of the crank without affecting the position of the latter. This crank g^2 works between a pair of pivoted jaws, P and R, which are, by springs h^2, normally held in the position shown in Fig. 9. Both of these jaws are pivoted to a projecting post, *i*, of the carriage I, as is also clearly shown in Fig. 4; and both are notched to receive the end of the crank g^2. Friction-rollers i^2 are hung in the outer parts of these jaws, as shown, and fixed stops j^2 on the bed-plate of the carriage constitute the limits of the motion imparted to such jaws by their springs h^2.

It will be observed, by reference to Figs. 8 and 9, that the pivot of the jaws P R is directly beneath the axis of the feed-bar J, that the jaws are of equal shape, and that the crank g^2 enters with its end the notch of one of the jaws. The position shown in Fig. 9 is the one which the crank will assume while the carriage moves in the direction of the arrow 1. Near the end of such motion the friction-roller i^2 of the jaw P that holds the crank arrives under a partly inclined, partly horizontal rail, l^2, that is rigidly secured to the frame A, and, the motion of the carriage being continued in the direction of the arrow 1, the friction-roller under such rail l^2 is gradually crowded down, and the jaw P thereby forced downward into the position shown in Fig. 8, and thereby disengaged from the crank g^2. At the same time the end of the crank g^2, or a friction-roller at such end, strikes the end of the rail l^2, and, the motion of the carriage continuing in the direction of the arrow 1, the crank is, by such contact with the fixed rail i^2, thrown over into the position shown in Fig. 8, whereupon the limit of motion of the carriage is reached. In this position the end of the crank g^2 enters the notch of the spring-jaw R, and is locked by the same in the desired manner.

It will be observed that as the crank g^2 is tilted the feed-bar J is tilted with it, and, consequently, also the loaf of sugar connected with the feed-bar. This tilting motion just described takes place after the loaf of sugar has once been grooved by the saws D, and before such loaf repasses such saws D, and therefore brings the loaf into position for receiving the additional set of grooves by the saws D, at right or other angle to the first set. On the return motion in the direction of the arrow 2 the end of the loaf is therefore grooved

by the saws D, at proper angles to the first grooving, and the grooved portions or blocks so formed on the end of the loaf are then detached by the saw F. At the end of the stroke of the carriage in the direction of the arrow 2 the friction-roller of the jaw R arrives under a fixed rail, m^2, and is thereby depressed and the said jaw affected in the same manner as the jaw P was affected by the rail l^2. The crank is then thrown back into connection with the jaw P, so that, on the carriage resuming motion in the direction of the arrow 1, the former relative position of the parts may again be had.

It has been above stated that when the carriage moves in the direction of the arrow 1 the pawls p and r are acted upon for feeding or pushing the bar J and the loaf of sugar.

By reference to Fig. 1, it will appear that the cams u and w, which affect such pawls, are placed in line with the space between the saws D and F, so that the feeding will occur while the carriage is passing from the saw F toward the saw D, and while, therefore, the crank g^2 is locked in the position shown in Fig. 9 to the jaw P, the aforementioned pawls are then vertically suspended beneath the feed-bar J, as shown in Fig. 3; but when at the end of the stroke, in the direction of the arrow 1, the crank g^2, by contact with the stop l^2, is thrown into the position shown in Fig. 8, the feed-bar is tilted in the same degree as the crank; the pawls will also be turned with the feed-bar, and brought from their vertical into a nearly horizontal position toward the axis of the feed-bar. The pawls will then and thereby be brought out of reach of the cams u w, so that on the return motion of the carriage in the direction of the arrow 2, the pawls will not be struck by such cams, and no feeding of the loaf toward the saws will then take place.

The operation can now be readily understood: While the carriage moves from F toward D, the loaf is fed beyond the plane of the face of F a sufficient distance to produce the required length of the blocks of sugar to be detached; the saws D then groove the end of the loaf to the requisite depth in one direction; the stop l^2 is then struck, the loaf tilted and conveyed back to be grooved again by the saws D at the requisite angle to the first set of grooves, and the blocks formed by such double grooving at the end of the sugar-loaf are finally detached by the saw F. The stop m^2 is then reached, the loaf tilted again to its first position, the carriage moved backward toward D, and as soon as the saw F has been cleared on such motion toward D, the loaf is again fed the requisite distance beyond the plane of F, and the operation continued until the entire loaf of sugar has been cut up, or at least so much as projects beyond the band M. The carriage I supports a hood, S, which rests on its bed-plate, and covers the plate J and all its appurtenances, including the loaf of sugar, as can be clearly understood by reference to Figs. 4 and 7. This hood will therefore keep the loaf out of sight, but has a handle, n^2, attached to its upper part to facilitate its removal, when desired. To a frame, o^2, that projects from the bed-plate h of the carriage I, where the same is nearest to the saw F, are secured the ends of two aprons or curtains, T U, that are, respectively, wound upon rollers p^2 and r^2, hanging vertically at the ends of the frame A, and shown in Fig. 1. These curtains are thus held on the carriage in front of the saws D and F, and are of sufficient height to properly close the space between such saws and the other part of the machinery. Their height is properly indicated in Fig. 3. The rollers p^2 and r^2 are also connected with each other by bands s^2 and t^2, which bands are, respectively, wound upon them in a reversed direction to the curtains, as shown in Fig. 3. When the carriage moves in the direction of the arrow 1, the apron or curtain U is being drawn and unwound from the roller r^2, and follows, therefore, the carriage, closing up the space between the saws and the outer part of the machinery as the carriage moves along. The roller r^2, being revolved by such unwinding of the apron U, winds up its belt t^2, and thereby unwinds the belt s^2 from the roller p^2, and the latter, being thus revolved, winds up the apron T at the same ratio of speed as the apron U is unwound from the other roller. When the motion of the carriage is reversed the reverse action of the curtains will take place, so that such curtains will always constitute a reliable shield for keeping the sugar-dust from reaching the operating parts of the machine.

A curtain, V, of sheet metal or other material, is constructed and supported on the frame A, behind the saws D and F, as shown in Fig. 1, so that, in connection with the aprons T and U, and also with the hood S, a separate chamber is produced, in which the saws operate upon the loaf of sugar, and all dust is prevented from reaching the operating-screw or the feed-bar J and the parts connected therewith.

The rigid curtain V may be downwardly extended to form a discharge-hopper, as shown in Figs. 3 and 4.

We also may attach to the rigid curtain V a pipe, Z, as shown in Fig. 1, which connects the chamber formed by the rigid curtain V, aprons T and U, and hood S with a suction apparatus, thereby separating the sugar-dust from the blocks of sugar.

Having thus described our invention, we claim as new and desire to secure by Letters Patent—

1. The curtains T and U, connected with the movable carriage I and wound upon rollers p^2 and r^2, for the purpose of constituting a shield for preventing the sugar-dust from reaching the operating parts of the machine, substantially as described.

2. The belts or band s^2 and t^2, combined with the rollers p^2 and r^2 and with the cur-

tains T and U, which are wound upon such rollers in the opposite direction to such belts or bands, substantially as and for the purpose herein shown and described.

3. The band or ring M, constructed with projecting hooks *o*, and made extensible and contractible, substantially as described, for application around the base of the sugar-loaf, as specified.

4. The combination of the plunger *m* on the rod L with the perforated head *j* of the tubular feed-bar J, for action against the base of the sugar-loaf, substantially as specified.

5. The combination of the head *j* of the tubular feed-bar J with the sliding shoe W, as specified.

6. The detaining-pawl *p*, arranged on the sleeve *x* and combined with the feeding-pawl *r* and cams *u* and *w*, for operation as described.

7. The jaws P and R, notched and applied to the carriage I, for operation substantially as described.

8. The combination of the crank g^2 of the sliding feed-bar with notched jaws P R and fixed stops l^2 and m^2, substantially as specified.

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