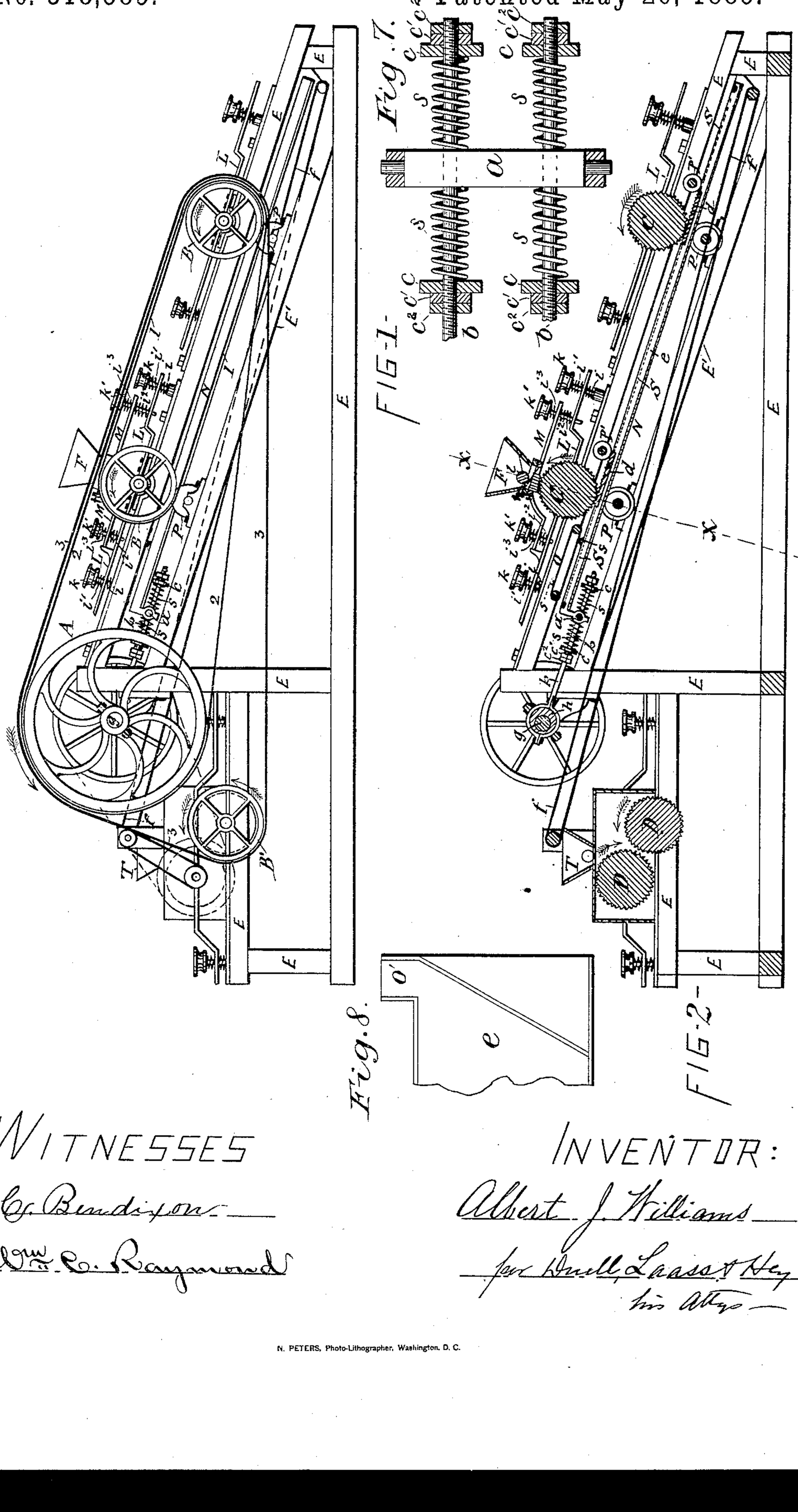
(No Model.) 3 Sheets—Sheet 1.

A. J. WILLIAMS.

GRAIN REDUCING APPARATUS.

No. 318,585. Patented May 26, 1885.



WITNESSES

C. C. Bendixon

Wm. C. Raymond

INVENTOR:

Albert J. Williams

per Hull, Lacey & Hay

his Attys

(No Model.) 3 Sheets—Sheet 2.

A. J. WILLIAMS.

GRAIN REDUCING APPARATUS.

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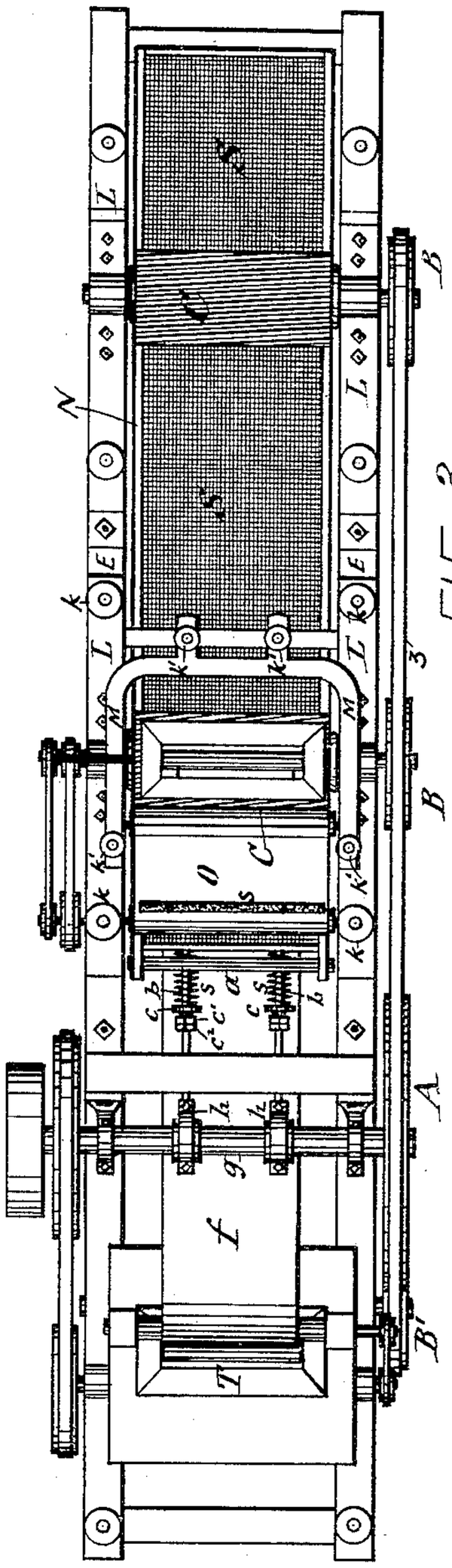

FIG. 3.

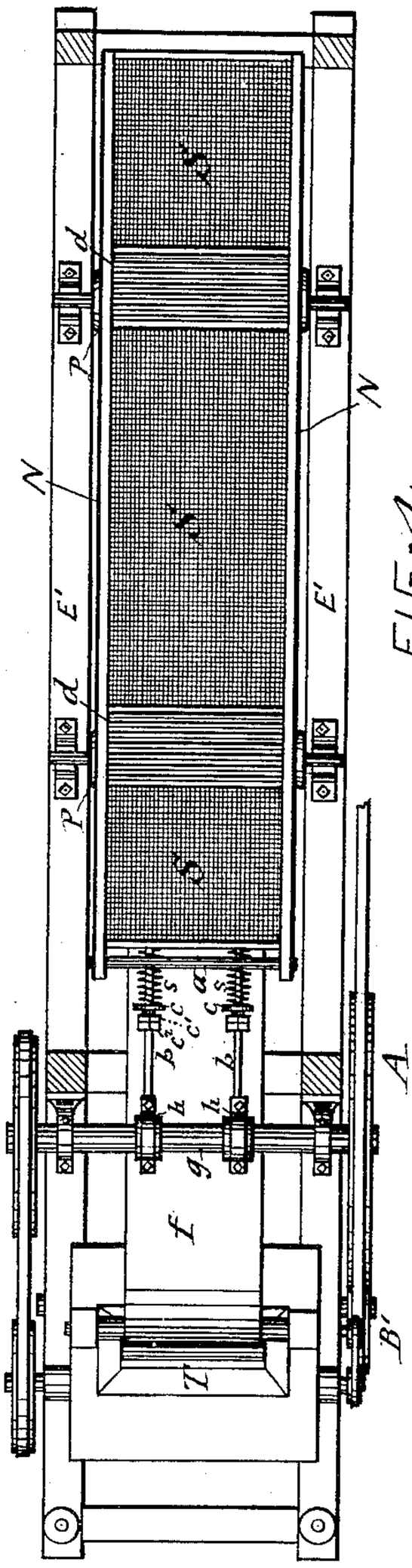

FIG. 4.

WITNESSES

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(No Model.) 3 Sheets—Sheet 3.

A. J. WILLIAMS.

GRAIN REDUCING APPARATUS.

No. 318,585. Patented May 26, 1885.

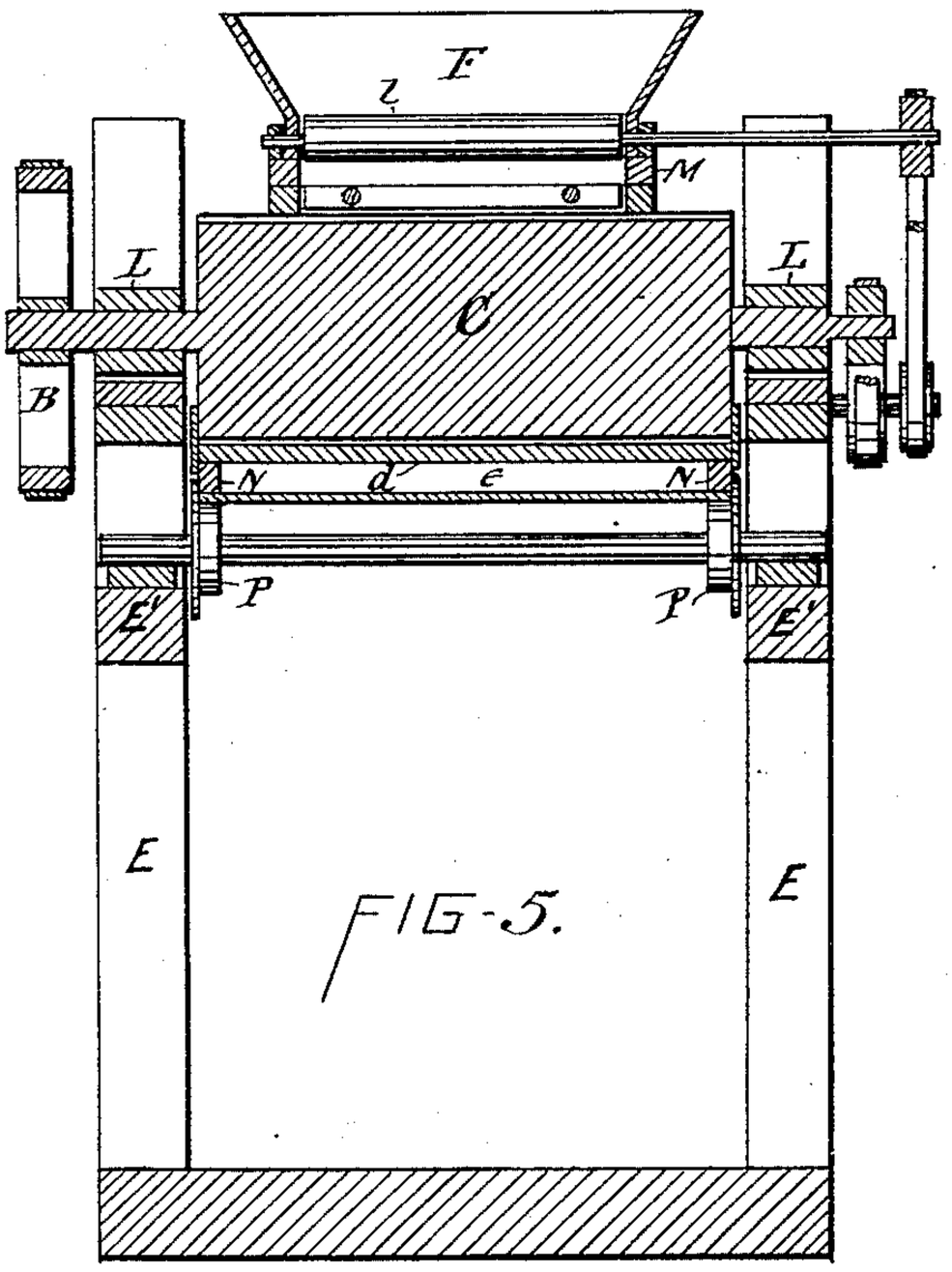

FIG-5.

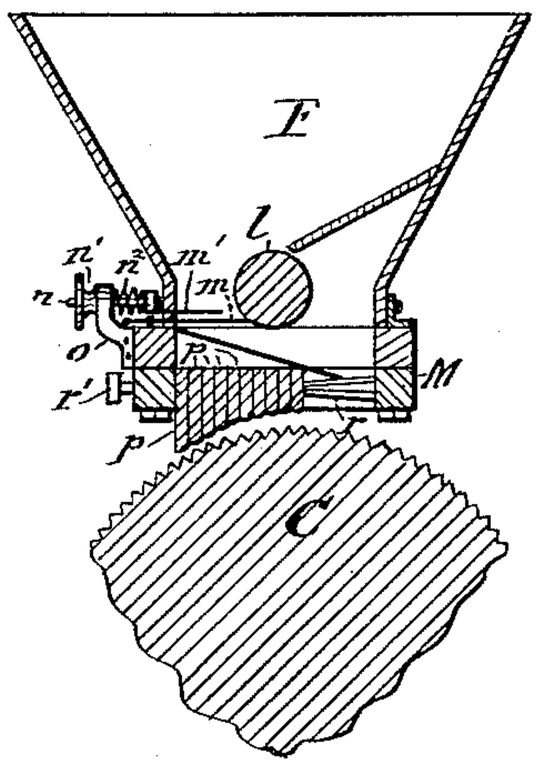

FIG-6.

WITNESSES

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UNITED STATES PATENT OFFICE.

ALBERT J. WILLIAMS, OF HANNIBAL, NEW YORK.

GRAIN-REDUCING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 318,585, dated May 26, 1885.

Application filed May 12, 1884. (No model.)

To all whom it may concern:

Be it known that I, ALBERT J. WILLIAMS, of Hannibal, in the county of Oswego, in the State of New York, have invented new and useful Improvements in Grain-Reducing Apparatus, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

This invention consists in a novel organization of an apparatus designed to rapidly and effectually reduce grain to middlings of superior quality; and the invention also consists in certain novel devices for regulating the feed to the apparatus, and for imparting the requisite motion to the mechanisms of the apparatus, and for properly sustaining and adjusting the same, all as hereinafter more fully described, and specifically set forth in the claims.

In the accompanying drawings, Figure 1 is a side elevation of my invention. Fig. 2 is a longitudinal vertical section of the same. Fig. 3 is a top plan view. Fig. 4 is a longitudinal section taken immediately below the grain-reducing rolls. Fig. 5 is an enlarged vertical transverse section on line *x x* in Fig. 2. Fig. 6 is a further enlarged sectional view of the hopper and devices connected therewith, showing the means for regulating the feed, and also illustrating the primary grain-splitting devices. Fig. 7 is an enlarged detail view of the cushioned connections of the pitman with the cross-head; and Fig. 8 is a detached plan view of the discharge end of the chute which carries off the middlings from beneath the sieves of the apparatus.

Similar letters of reference indicate corresponding parts.

E E′ designate the main supporting-frame of the grain-reducing machine. Upon parallel inclined beams E′, at opposite sides of said frame, are journaled flanged rollers P P, which carry an inclined frame, N, extended nearly or quite the length of the main frame. Rollers P′ bearing on the tops of the side edges of the aforesaid frame serve to steady it in its movement. The frame N receives a longitudinal rectilineal reciprocating movement from the main driving-shaft *g* by means of eccentrics *h*, secured to said shaft, and eccentric-rods or pitmen *b*, connected with the eccentrics and extended through a cross-head, *a*, which is pivoted on the head of the frame N, so as to allow it to oscillate thereon. The pitmen are extended loosely through the cross-head, so as to allow them to move longitudinally thereon, and at opposite sides of the cross-head the pitmen are provided with collars *c c*, between which and the cross-head springs *s s* are interposed. The collars *c* are mounted movably on the pitmen, and back of said collars the pitmen are screw-threaded and provided with nuts *c′ c′*, by the movement of which toward or from the cross-head the interposed springs *s s* are more or less compressed, and caused to present a greater or less resistance to the movement of the pitmen on the cross-head. Jam-nuts c^2 c^2, back of the nuts *c′ c′*, serve to retain the latter in their required positions.

It will be observed that the springs *s s*, applied to the pitmen, having an end-play on the cross-head, constitute cushioned or yielding end bearings, which transmit the reciprocating motion to the cross-head without incurring jars or pounding of the pitmen and parts connected therewith, and by pivoting the cross-head *a* in the manner shown torsional strain on the pitmen is effectually obviated. While one pair of springs exerts their power on the cross-head and are thus compressed, the springs at the opposite side of the cross-head are allowed to expand to a proper condition to receive the strain incident to the reverse motion of the pitmen, which motion they transmit gradually to the cross-head. The reciprocating frame N has attached to it heavy steel or other hard-faced metal plates, *d d*, which are straight and roughened, preferably corrugated transversely in relation to the movement of the reciprocating frame N, and at the ends of said plates, and in the same plane therewith, are sieves S S, also secured to the frame N. A chute, *e*, is formed on the frame N, underneath the sieves, and provided with a suitable outlet, *o′*, at its side, as shown in Fig. 8 of the drawings, which chute serves to carry off the middlings which fall through the sieves. In long machines the chute *e* is to be provided with more than one of the aforesaid outlets *o′*. Over the corrugated plates *d d* are roughened or longitudinally-corrugated rolls C C, arranged with their axes at right angles to the movement of the frame N. The corrugations of the rolls I pre-

fer to dispose obliquely, as illustrated in Fig. 3 of the drawings, for the purpose hereinafter made apparent. For fine reduction to flour, however, I employ a smooth reciprocating plate with a smooth roller. The rollers C are each supported adjustably over the subjacent corrugated plates *d* by means of frames L, provided with suitable boxes or bearings for the journals of the rollers, and extended across the top of the frame E, on which they are yieldingly supported by springs *i i*, interposed between said frames. By means of set-screws *k k*, passing through the frames L and into the subjacent frame, the frames L are sustained against lateral and longitudinal displacement, and by springs *i'*, interposed between the heads of the set-screws and the frames L, the latter receive a yielding downward pressure from the set-screws. Said frames are thus sustained between springs, which allow them a limited vertical vibration. F denotes the hopper, arranged over the upper roll C, and supported adjustably in its position by a frame, M, to which the hopper is secured, said frame being extended across the top of the frame L, and supported on springs i^2, interposed between the frame M and subjacent frame L. Set-screws *k' k'* pass through the upper and into the lower of said frames, and springs i^3 i^3 are interposed between the heads of said set-screws and frame M, to allow the latter to vibrate vertically, similar to the frame L.

The hopper is provided with the usual feed-roll, *l*, and in lieu of the usual single feed-regulating slide I employ two slides, *m* and *m'*, on one and the same side of the hopper, and arranged one directly under the other. The lower slide, *m*, is of the ordinary construction, and adapted to be moved freely to and from the feed-roll for closing and opening the passage from the hopper to the subjacent grain-reducing roll C. The other slide, *m'*, is adjusted in its position by means of set-screws *n*, connected therewith and extending through brackets *o*, secured to the exterior of the hopper, at the outside of which brackets, nuts, or screw-threaded hand-wheels *n'* are connected to the set-screws for drawing the slide outward, and springs n^2, interposed between the slide and inner side of the bracket, push the slide inward. This slide I employ solely for regulating the feed. For shutting off the feed, when desired, I use the ordinary slide, *m*, and leave the other slide, *m'*, undisturbed in its adjusted position, thus obviating the necessity of readjusting the feed after closing the same.

Between the feed-roll *l* and grain-reducing roll C, I arrange a series of steel plates, *p p*, as best seen in Fig. 6 of the drawings, which plates are set edgewise over the face of the roll C, and lengthwise of the same, and secured to the frame M by means of a stud, *r*, projecting from said frame and bearing against one side of the series of plates *p p*, and a set-screw, *r'*, passing through the opposite side of the frame and pressing the series of plates against the stud *r*. The edges of the plates facing the roll C are rounded transversely, and conjointly present a corrugated face toward the roll C. The space between said face and roll is gradually diminished or wedge-shaped, so as to allow the grain to freely enter, and cause the same to become gradually subjected to the impingement or abrading action of the two corrugated surfaces, as will be hereinafter explained.

O represents an endless apron or belt extended from the roll C toward the head of the reciprocating frame, for the purpose of conveying to the latter the grain thrown upon the belt by the roll C. Across the belt is attached one or more brushes, *s*, which by the movement of the belt are caused to sweep over the subjacent sieve S of the reciprocating frame N, and thereby sweep the grain toward the corrugated plate *d*.

D D designate two corrugated grain-reducing rolls arranged beyond the head of the reciprocating frame N, and provided with a hopper, T, which communicates with the foot of the reciprocating frame N by a suitable conveyer, *f*, which may consist simply of an endless apron, as shown. The several grain-reducing rolls are provided with pulleys on the ends. The rolls C C and one of the rolls D receive rotary motion in the direction indicated by arrows in Fig. 1 of the drawings by means of driving-belts arranged as follows: A belt, 1, connects with the pulleys B B of the rolls C C, a belt, 2, is extended from the driving-pulley A around the farthest pulley B, and runs thereat on top of the belt 1, and a belt, 3, is extended from the driving-pulley A to the pulley B', and thence to the farthest pulley B, and runs on top of belt 2, between said pulley B and driving-pulley, as shown in Fig. 1 of the drawings.

By the described arrangement of the driving-belts I insure a more positive and synchronous movement of the several rolls. Other belts are arranged in the ordinary mechanical manner to transmit motion to the upper grain-reducing roll D, and to the feed-rolls of the two hoppers, and a pulley is attached to the main shaft *g*, and connected by a belt with the pulley of the prime motor. (Not here shown.)

The operation of my described grain-reducing apparatus is as follows: The driving-shaft *g*, being set in motion, imparts a reciprocating motion to the frame N and rotary motion to the several grain-reducing rolls and feed-rolls. The slide *m* of the hopper being withdrawn, and the feed-regulating slide *m'* being properly adjusted for the requisite flow of grain from the hopper, said grain drops onto the upper portion of the periphery of the upper roll C, which carries the grain under the edges of the series of plates, and by the impingement of the corrugated faces of the roll and plates the grain becomes split longitudinally. It thence falls onto the endless belt O, which conveys it to the head of the reciprocating frame N, where the grain falls onto the first sieve, S, which removes the

finer particles of the split grain and causes the coarser particles to advance to the corrugated plate *d*. In passing over this plate it is subjected to the impingement of the corrugated roll C, said impingement being rendered intermittent and momentary by the reciprocating movement of the plate *d*, which in its downward movement draws the grain quickly under the roller, and in its upward movement exerts a sudden abrading action on said grain, thereby effectually disintegrating the grain without subjecting the bran to excessive rubbing, which latter tends to discolor the middlings. As the middlings pass from the upper roll to the lower roll C they are subjected to the scalping action of the intervening sieve, S, which separates the fine from the coarse middlings. The second roll operates on the middlings brought thereto by the reciprocating movement of the sieve S in the same manner as the first roll, and the said operation can be continued by additional rolls and additional sieves and corrugated plates. Such of the broken grain as escapes from the foot of the reciprocating frame N is conveyed by the conveyer *f* to the rolls D D to complete the process of disintegrating the grain.

Having described my invention, what I claim is—

1. In combination with the hopper F, feed-roll *l*, and the slide *m*, adapted to move freely to and from the feed-roll, the slide *m'*, arranged over the slide *m*, and the set-screws *n*, hand-wheels *n'*, and spring n^2, for controlling the slide *m'*, substantially as described and shown.

2. In combination with the grain-reducing roll and the hopper, a frame interposed between said parts, and a series of plates clamped detachably in said frame and disposed longitudinally and edgewise in relation to the roller, substantially as specified and shown.

3. In combination with the main frame of the machine, a reciprocating plate, a grain-reducing roller over said plate, the frame L, extended across the main frame and provided with journal-bearings for the aforesaid roller, springs *i i* interposed between said frames, set-screws holding the frame L on the springs *i i*, and springs *i' i'* interposed between the frame L and heads of the set-screws, substantially in the manner specified and shown.

4. In combination with the grinding-plate *d*, roller C, and its supporting-frame L, the frame M, mounted on the frame L, springs i^2 i^2 interposed between said frames, set-screws holding the frame M on the springs i^2 i^2, springs i^3 i^3 interposed between the frame M and heads of the set-screws, and the hopper mounted on the frame M, substantially as set forth and shown.

5. In combination with the reciprocating frame N, carrying sieves and corrugated plates, and the grain-reducing roller C, revolving with the upper portion of its periphery toward the head of the reciprocating frame, the endless belt O, arranged to convey the grain from the roller to the head of the aforesaid frame, substantially as described and shown.

6. In combination with the reciprocating frame N, carrying sieves and corrugated plates, and the grain-reducing roller C, revolving with the upper portion of its periphery toward the head of the frame N, the endless belt O, arranged to convey the grain from the roller to the head of the aforesaid frame, and a brush or brushes attached to said belt, substantially as described and shown.

7. The combination of the reciprocating frame N, provided with the grain-reducing plate *d*, the supporting-rollers P P under said frame, and the grain-reducing roller C over the plate *d*, substantially as described and shown.

8. In combination with the reciprocating frame N, provided with the corrugated plates *d* and sieves S, the corrugated rollers C over the plates *d*, the chute *e* under the sieves, a set of co-operating grain-reducing rollers, D D, and a conveyer, *f*, extended from the foot of the reciprocating frame to the hopper of the rollers, substantially as described and shown.

9. In combination with the reciprocating frame N, provided with corrugated plates *d d*, corrugated rollers C C over said plates, and a set of grain-reducing rollers, the main driving-pulley A, pulleys B, B, and B', connected, respectively, to rollers C C and D, the belt 1, connecting the two pulleys B B, the belt 2, extended around the driving-pulley and farthest pulley B, and running thereat on top of the belt 1, and the belt 3, extending from the driving-pulley A to the pulley B', and running on top of belt 2 between the farthest pulley B and driving-pulley A, substantially as described and shown.

In testimony whereof I have hereunto signed my name and affixed my seal, in the presence of two attesting witnesses, at Oswego city, in the county of Oswego, in the State of New York, this 8th day of May, 1884.

ALBERT J. WILLIAMS. [L. S.]

Witnesses:
ALBERT W. SMITH,
CHAUNCEY C. PLACE.