4 Sheets—Sheet 1.

G. DAVERIO.

Crushing Rolls.

No. 200,263. Patented Feb. 12, 1878.

Fig. 1.

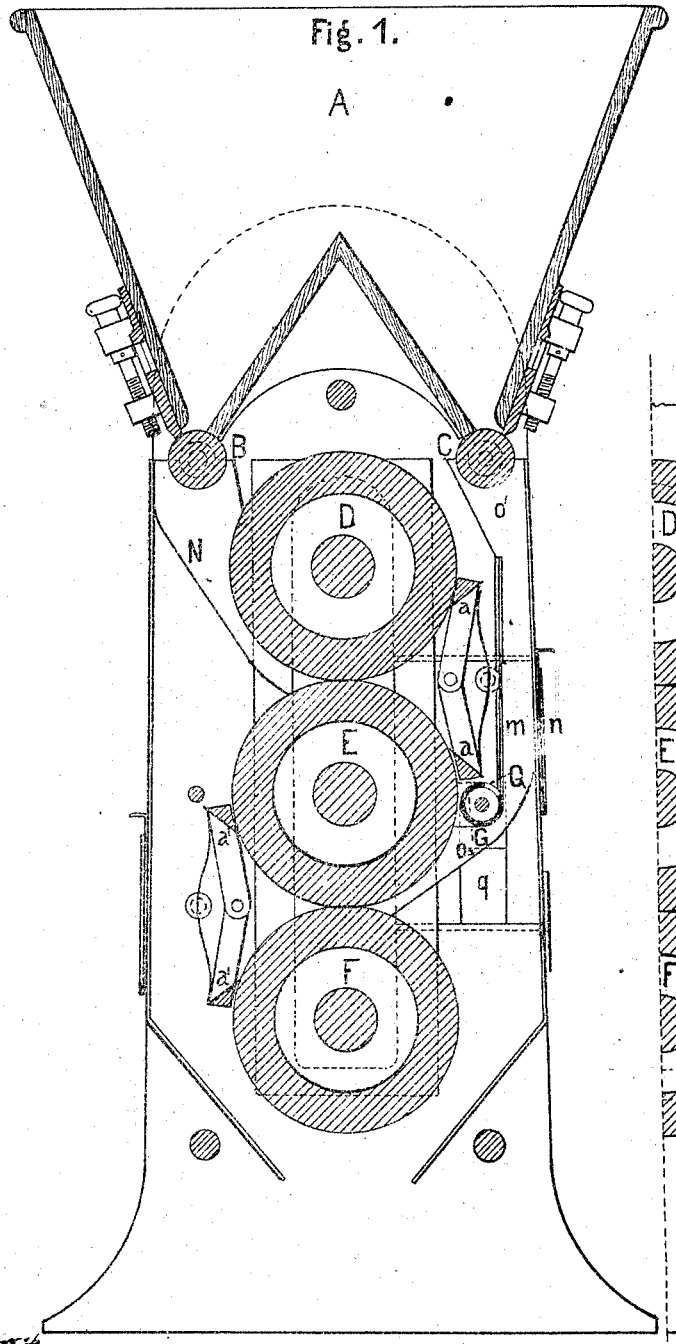
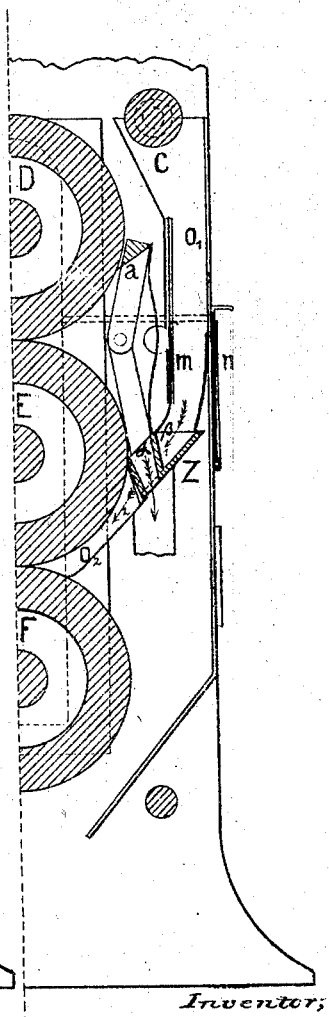


Fig. 5.



Witnesses,
Geo. H. Graham
J. R. Ely

Inventor;
G. Daverio.
by Munson & Philipp
Attorneys

4 Sheets—Sheet 2.

G. DAVERIO.

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Fig. 6.

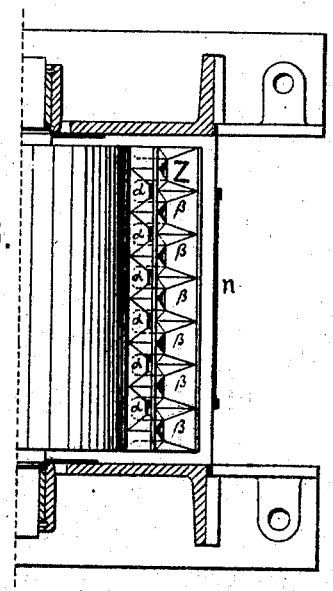
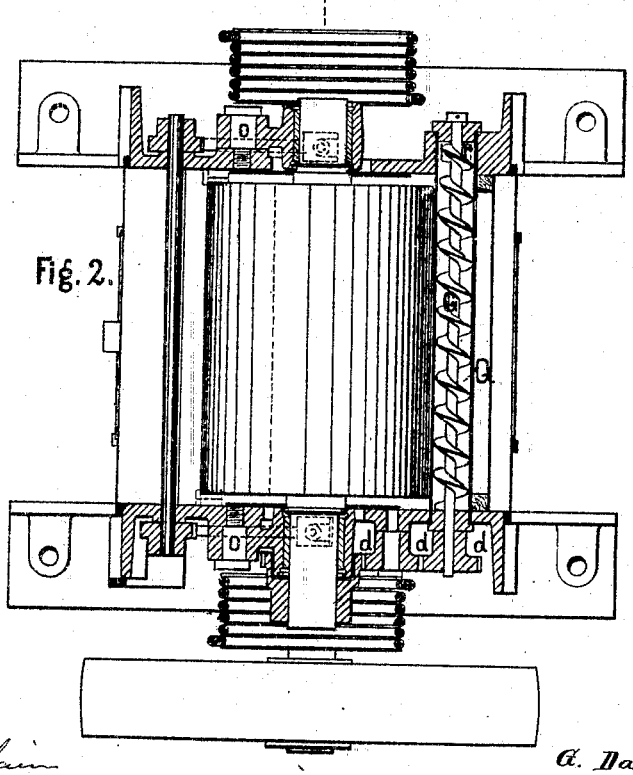


Fig. 2.



Witnesses:

Geo. H. Graham

J. R. Dey

Inventor:

G. Daverio,

by Munson & Philipp

Attorneys

4 Sheets—Sheet 3

G. DAVERIO.

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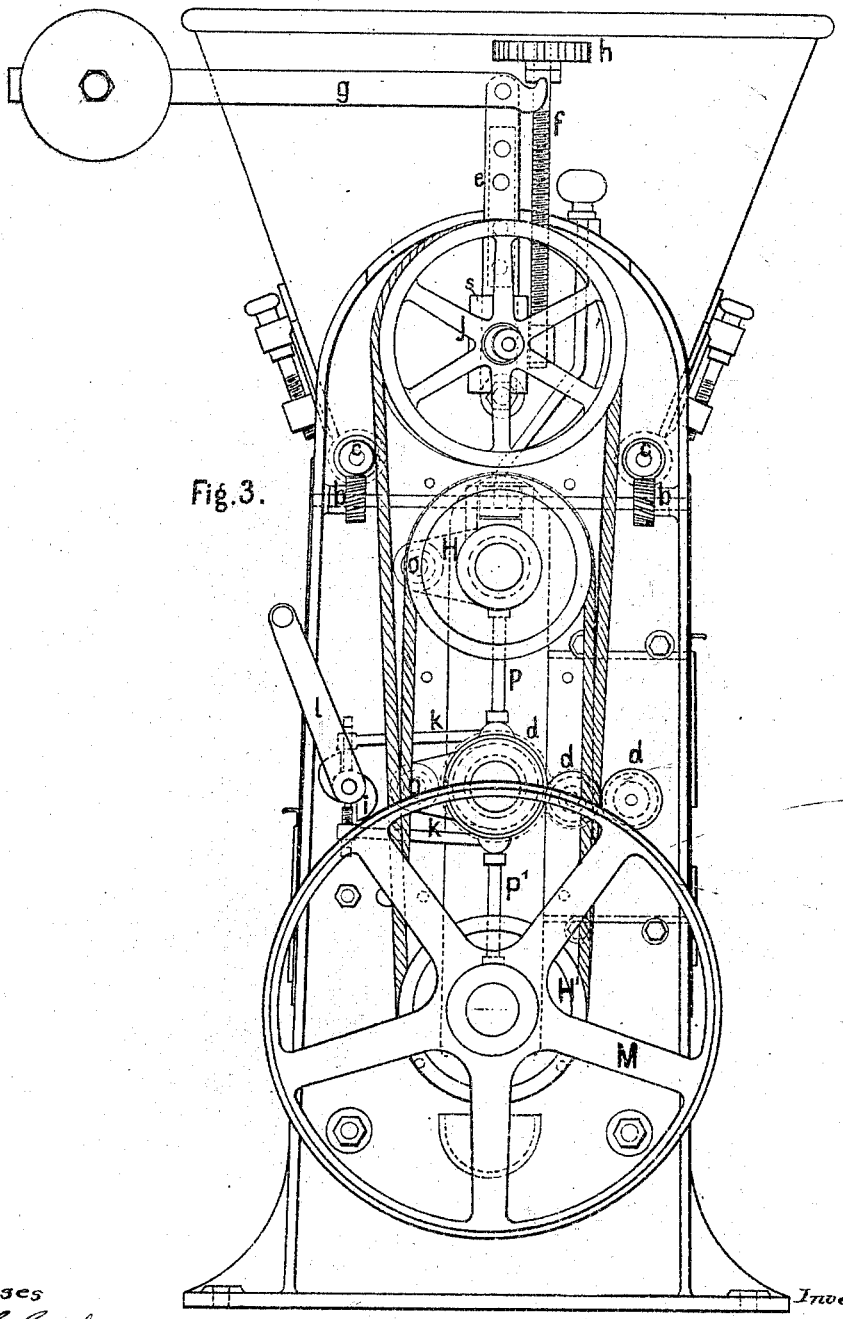
Fig. 3.



Witnesses
Geo. H. Graham
J. R. Ely.

Inventor,
G. Daverio.
by Munson & Philipp
Attorneys

4 Sheets—Sheet 4.

G. DAVERIO.

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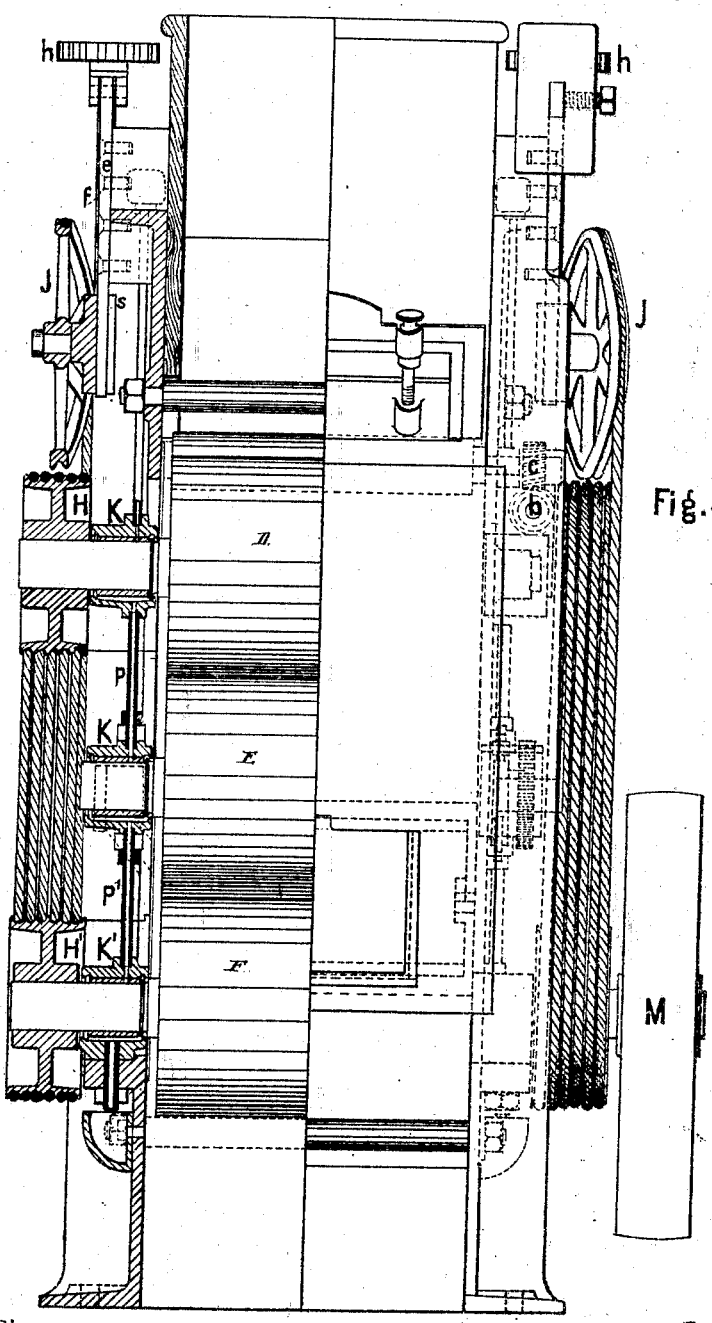

Fig. 4.

Witnesses;
Geo. H. Graham
J. R. Ely

Inventor,
G. Daverio,
by Munson & Philipp
Attorneys

UNITED STATES PATENT OFFICE.

GUSTAV DAVERIO, OF OBERSTRASS, NEAR ZÜRICH, SWITZERLAND.

IMPROVEMENT IN CRUSHING-ROLLS.

Specification forming part of Letters Patent No. 200,262, dated February 12, 1878; application filed November 6, 1877.

To all whom it may concern:

Be it known that I, GUSTAV DAVERIO, of Oberstrass, near Zürich, Switzerland, have invented Improvements in Machines with Smooth Rollers for Grinding Wheat and other grain, of which the following is a specification;

This invention relates to that class of flour-mills in which the corn is ground between rollers. Its object, in the first instance, is to reduce the pressure on the journals of the rollers, and, in the second, so to arrange the channels for the corn and the flour as to allow two separate grinding processes to be carried on between three rollers. For this purpose rope pulleys are keyed on both ends of the shafts of the upper and the lower rollers, which pulleys have a number of grooves on their peripheries. Above each pair of the said pulleys an expanding-pulley is placed, turning on a pivot which is fixed to a sliding piece acted upon by a weighted lever. A rope is coiled around each of the first-described pairs of pulleys in as many coils as there are grooves in them, and is finally led over the expanding-pulley after the ends of the same have been spliced together. The rope being drawn tight by the action of the weighted lever, the pulleys on the roller-shafts are forcibly drawn toward each other in a similar manner as a pair of tackle-blocks, whereby the pressure of the journals is almost entirely taken off from the bearings, the strain of the rope, however, causing the necessary amount of pressure between the rollers.

As to the second part of the invention, the grain is conducted from the hopper by one channel between the upper and the middle roller, and by another between the latter and the lower roller. Between the second channel and the middle roller a worm or creeper is placed, which conveys the flour produced by the upper pair of rollers laterally out of the casing of the mill, so as to prevent it from being mixed with the grain passing through the second channel. Instead of using a creeper, a number of small funnel-shaped passages may be made to traverse the second grain-channel, by which the flour in that case passes directly downward.

A mill arranged according to my improved system is represented on the annexed sheet of drawings, Figure 1 being a vertical cross-section; Fig. 2, a sectional ground plan; Fig. 3, an end elevation, and Fig. 4 a side elevation, partly in section. The Figs. 5 and 6 show the modified arrangement, respectively, in a vertical cross-section and in ground plan.

A is a hopper with the two feed-rollers, B and C, which are driven by the worms *b* and wheels *c*, the shaft of the former receiving motion by another worm-wheel gearing from the shaft of the upper roller. D, E, and F are the three grinding-rollers, the lower one of which revolves by its journals in common fixed bearings K′, while the shafts of the rollers D and E turn in bearings K K, which are free to oscillate on pivots *c c*. M is a common driving-pulley. H and H′ are the rope pulleys keyed on the shafts of the rollers D and E. As represented in the drawing, the lower pulleys H′ have six grooves, the upper ones, H, five, so that there are five coils of rope around each pair of these pulleys, the sixth coil running from the lower pulley H′ to the expanding-pulley J, which must be placed at an angle, as shown by the drawing. The number of grooves in the pulleys may, however, be varied according to desire. The pulley J turns on a pivot fixed to a sliding block, *s*, which works on a guide-bar, *e*. *f* is a screw passing through a lug on the block *s*, and which may be turned by the wheel *h*, so as to adjust the pulley J with regard to the length of the driving-rope. *g* is a lever, the short forked end of which acts on a washer under the wheel *h*, while its long end carries a weight which determines the tension required in the rope. Between the bearings gas-tubes *p p′* are placed for the purpose of conducting oil from one bearing to the other, and also for shifting the rollers apart, if this is desired. For the latter purpose the tubes have collars on which the levers *k k* act, which may be moved by the cams *i* and the hand-lever *l*. This arrangement is made use of when the machine is to be stopped, as thereby an accumulation of grain before the rollers, which may cause a difficulty in starting them again, is prevented.

Supposing the weight on each lever *g* to be twenty pounds, and the proportion of the lever-arms as 1 to 10, the strain on each pulley J will be two hundred pounds. The ten-

sion in each part of the driving-rope is therefore one hundred pounds, and consequently the roller D is pressed at each end with a force of one thousand pounds, the roller F with a force of twelve hundred pounds against the roller E. The bearings of the rollers D E, however, are not subject to any pressure, and only serve as guides for the roller-shafts. The upward pull of the two rope parts leading to the pulley J, which would cause a pressure on the bearing of the roller F, is nearly counterbalanced by the weight of the three rollers, which, in a mill carried out on the described plan, amounted to three hundred and forty pounds. The bearings of the roller F are therefore in this case exposed to a very slight pressure only, which would become zero if the strain caused by the levers *g* were made equal to the weight of the three rollers. The described arrangement of driving-gears may also be applied in case of two rollers, and for other purposes than the grinding of corn.

The driving-ropes must be made of the best hemp, and before using them they have to be well stretched by a weight equal to about four times their working strain. It is even preferable to expand the rope by letting it run for some time on a special machine, in which pulleys are arranged in the same style, as described, for the mill.

For the better preservation of the rope it is advantageous to impregnate it with a composition consisting of fish-oil, a solution of india-rubber, and a small quantity of rosin, and then to let it dry in the open air.

If it is desired to impart different speeds to the rollers, so as not only to crush the grains, but to reduce them by a grinding action, this may be attained by making the lower rope pulleys larger in diameter than the upper ones. If corn is to be ground coarsely by fluted rollers this arrangement is even necessary; but it may also be used with rollers of porcelain, or other material having a natural roughness of surface, for the purpose of producing flour.

The second part of my invention consists in the arrangement by which two separate grinding processes may be carried on with three rollers. The corn fed in from the hopper A by the feed-roller B descends through the channel N, and is crushed between the rollers D and E. The resulting meal, after being taken off from the rollers by the scrapers *a a*, falls through a slit into the tube Q, in which a worm, G, rotated by the wheels *d d*, conveys it toward an opening, *r*, whence it is led back to the lower part of the mill, to be finally conducted to the dressing-machine. The corn passing over the feed-roller C into the channel o^1 o^2, for the purpose of being crushed between the rollers E and F, is thus kept separated from the meal produced by the rollers D and E. *m* and *n* are slides, by which an examination of the space between these rollers and the channel o^1 o^2 is made possible. The meal produced between the rollers E and F, after being scraped off by the scrapers *a' a'*, is directly conveyed into the dressing-machine.

The modified arrangement for keeping the meal produced by the upper rollers separate from the corn passing through the channel o^1 o^2 is shown by the Figs. 5 and 6. A number of funnel-shaped passages, *d d*, in this case, traverse the said channel, and allow the meal to fall directly into the same conduit toward the dressing-machine as the meal coming from the rollers E F. The upper and the lower parts of the channel o^1 o^2 communicate with each other between the funnels *x x* by the spaces *z z*, which may also be made funnel-shaped at the top.

The advantages attained by the described improvements are the following: First, the speed of the crushing-rollers may be increased without danger of causing the bearings to heat, which otherwise very easily occurs in these mills; second, in consequence of the arrangement by which two separate grinding processes can be carried on by three rollers, the performance of the improved mill is equal to that of a mill with four rollers of the common system; third, on account of the great reduction of friction in the bearings, and the increase of performance with regard to the number of rollers, the quantity of meal, &c., produced is considerably augmented in proportion to the power expended.

I claim as my invention—

1. In a mill having two or three rollers, the combination of the rope pulleys H H', having a number of grooves, with an expanding pulley, J, and a corresponding driving-rope, as and for the purpose specified.

2. The combination of the three rollers D, E, and F, the two feed-channels N and o^1 o^2, and the worm or creeper G, as and for the purpose described.

3. The combination of the two independent feed-channels N and o^1 o^2 with the three rollers D E F, whereby the grinding operation may be carried on independently between the rollers D E and E F, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GUSTAV DAVERIO.

Witnesses:
H. SPRINGMANN,
J. H. HAMMOND.