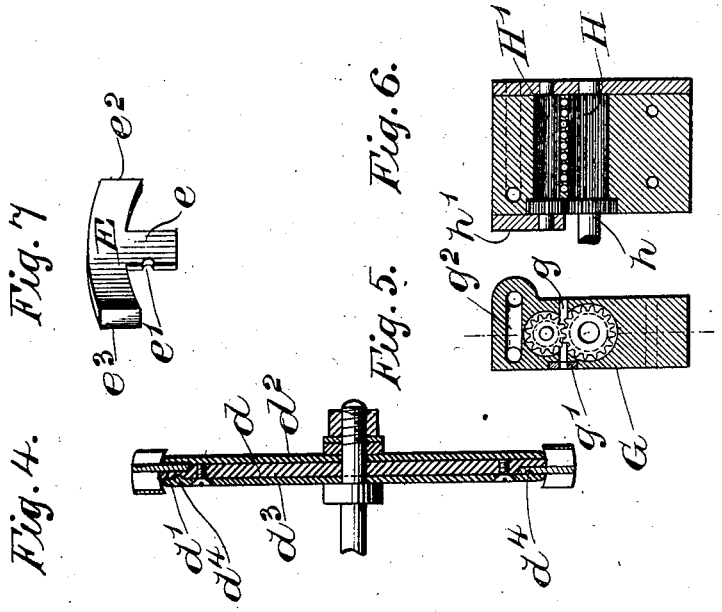
No. 648,723. Patented May 1, 1900.

J. H. BROWN.

POWDER GRANULATING MACHINE.

(Application filed Nov. 27, 1896.)

(No Model.) 2 Sheets—Sheet 1.



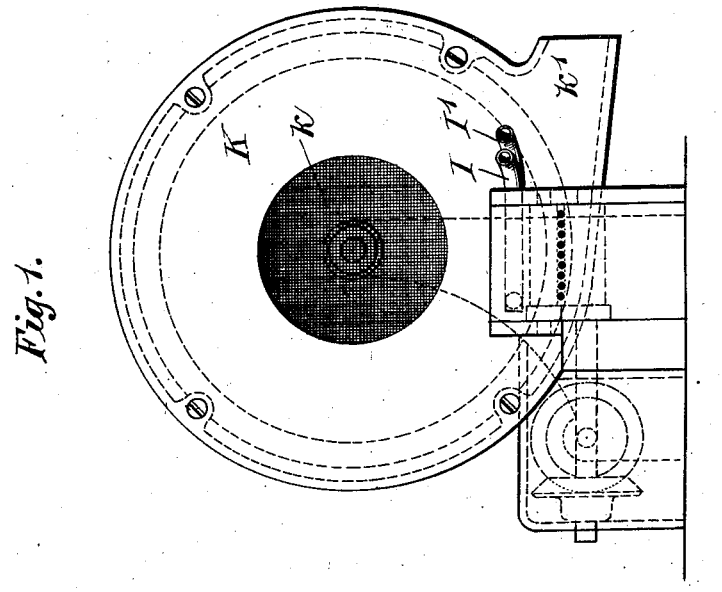




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Fig. 2.

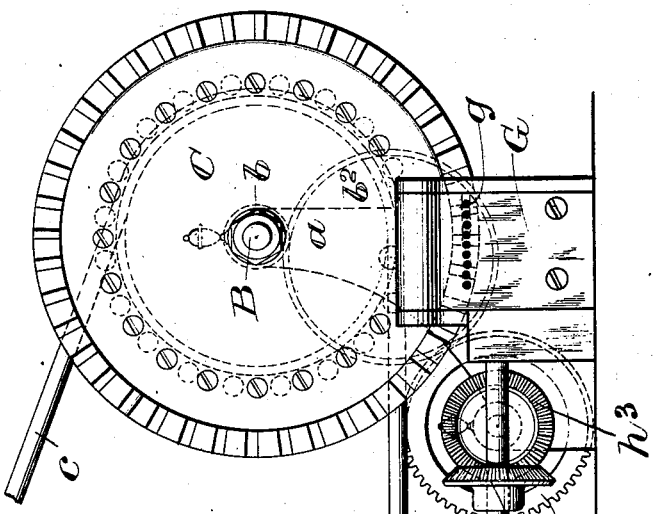
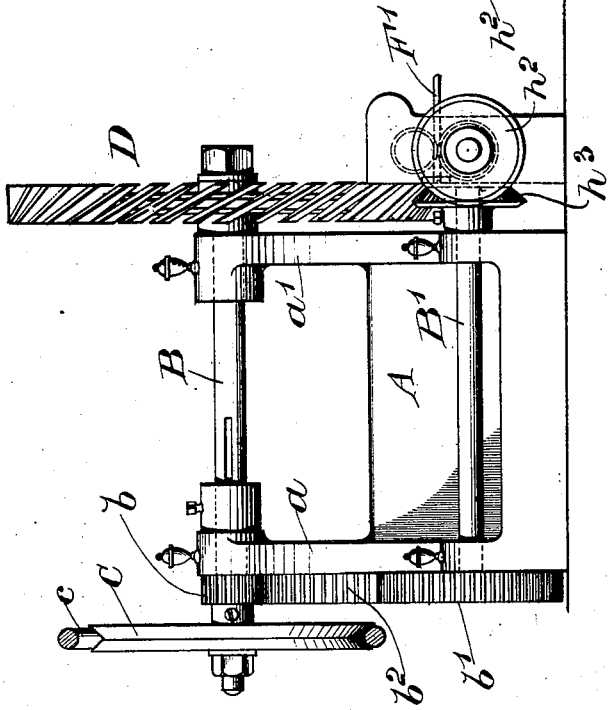



Fig. 3.

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# UNITED STATES PATENT OFFICE.

JOHN H. BROWN, OF NEW YORK, N. Y., ASSIGNOR TO THE AMERICA SMOKELESS POWDER COMPANY, OF POMPTON LAKES, NEW JERSEY.

## POWDER-GRANULATING MACHINE.

SPECIFICATION forming part of Letters Patent No. 648,723, dated May 1, 1900.

Application filed November 27, 1896. Serial No. 613,529. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN H. BROWN, of the city and county of New York, in the State of New York, have invented a new and useful Improvement in Granulating-Machines, of which the following is a specification.

My invention relates to an improvement in granulating-machines and more particularly to machines for subdividing strings of smokeless powder into grains of the desired size.

It is well understood that it is of the highest importance that the grains of a high explosive should be of uniform size in order to produce the best effects upon the projectile; and to this end it is common to form the powder in elongated strings or rods of uniform diameter by forcing it through dies of the desired size and then cutting the strings or rods into pieces.

My present invention provides for cutting the aforesaid strings or rods into various uniform sizes according as the grain is desired to be of a coarser or finer grade.

In the accompanying drawings, Figure 1 represents a machine in side elevation as it appears in use. Fig. 2 is a similar view with the casing, which forms, in conjunction with the saw or rotary cutter, a blower for cooling and expelling the grains, removed. Fig. 3 is a view in front or end elevation with the casing removed from the saw or cutting-wheel. Fig. 4 is a transverse section taken centrally through the saw or cutting-wheel. Figs. 5 and 6 represent vertical sections taken from front to rear and from side to side, respectively, through the block in which the feed-rollers are mounted; and Fig. 7 is an enlarged view in detail of one of the cutting-teeth.

The bed of the machine is denoted by A. It is provided with standards $a$ $a'$, uprising therefrom, in which a cutter-driving shaft B is journaled. The shaft B is provided at one end with a drive-pulley C, actuated by a belt $c$, leading to a suitable source of power. (Not shown.) At its opposite end the shaft B has fixed thereon the saw or cutting-wheel, (denoted as a whole by D.) The cutting-wheel D consists of a central disk $d$, (see Fig. 4,) the periphery of which is provided with a series of diagonal slots or sockets $d'$ for the reception of the shanks $e$ of the cutting-teeth E. The sockets $d'$ for the reception of the cutting-teeth are located at exactly equal intervals apart around the periphery of the disk $d$, and the teeth when inserted in the sockets $d'$ are held securely in position therein by means of the side plates $d^2$ $d^3$, which are screwed to the opposite sides of the disk $d$. One of the plates $d^2$ $d^3$—in the present instance the plate $d^3$—is provided with an annular bead $d^4$, adapted to engage recesses $e'$, formed in the shanks of the teeth E, when they are inserted in cutting position.

It is essential that the teeth E be set with great precision, as the slightest variation would immediately be noticed in the abnormal increase or decrease in the size of the grain, and it is further of importance that the edges of the cutters should be formed at such an angle as to resist wear as far as possible. To this end I provide the cutting-teeth E with oppositely-extending cutting ends $e^2$ $e^3$, which project slightly beyond the opposite sides of the cutting-wheel D, forming the opposite sides of the wheel symmetrical as to the cutters inserted therein, so that the wheel, when the cutters upon one side become slightly worn or dulled, may be slipped from its position on the shaft B and reversed side for side and again set in position to continue its work.

The strings of material which are to be cut into grains are denoted by F'. (See Fig. 3.) They may be fed to the cutting-wheel singly or in groups, the latter being preferred because of the material saving in time and expense. The number of strings which can be feasibly fed at one time depends upon the size of the strings and upon the width in a radial direction of the cutters, the number represented in the present instance being nine. The several rods F are fed in a direction transverse to the path in which the cutting-wheel rotates through guide-holes $g$, formed in a cutting-block G, spaced from the bed-plate A a distance sufficient to permit the cutting-wheel to rotate between them, as shown in Fig. 3. In the block G and upon opposite sides of the guide channels or holes $g$ there are mounted guide-rollers, (denoted, respectively, by H H',) connected by gear-

wheels $h$ $h'$ and so located with respect to each other that their adjacent faces will press slightly against the opposite sides of the several strings F of material to urge them forward into engagement with the cutters. The guide-block G, at that portion of its face where the strings F escape from it into the path of the cutters, is provided with a stationary plate $g'$ of some hardened metal which will act, in conjunction with the cutters, as a shear for severing the grains cleanly from the strings.

The strings F of smokeless powder are quite limber and their tendency to buckle as they are being forced forward to the cutters should be provided against in order that the feed may be absolutely uniform. It is also of great importance that they should be kept as cool as possible while being fed to the cutters, and to accomplish cooling and steady feeding of the strings I make the feed-rollers of small diameter and make the upper feed-roller of smaller diameter than the lower, thereby permitting the walls of the holes $g$ to extend in close proximity to the points where the adjacent faces of the feed-rollers engage the strings and at the same time permit the chamber $g^2$ within the block G for applying a cooling liquid to the block to approach nearer to that portion of the block along which the strings travel. The cooling liquid may be passed into and out of the chamber $b$ in the block G through suitable pipes I I'. (See Fig. 1.)

The feed-rollers H H' are driven by means of a bevel gear-wheel $h^2$, fixed on the axle of the roller H and intermeshing with a corresponding bevel gear-wheel $h^3$, fixed on a counter-shaft B', which is driven from the shaft B by means of a pinion $b$ on the shaft B, a gear-wheel $b'$ on the shaft B', and an intermediate gear-wheel $b^2$, engaged with the pinion $b$ and gear-wheel $b'$.

For the purpose of removing the grains promptly out of the way of the cutters as fast as they have been severed from the strings and at the same time applying a cooling medium to the grains at the time of cutting I surround the saw or cutting-wheel D with a casing K, having a single opening $k$ at the side which opening is covered with a gauze to permit the inflow of air within the casing and at the same time prevent foreign substances from being drawn into the casing, the said casing being further provided with an outlet mouth or nozzle $k'$ at its periphery, near the point where the grains are severed from the strings, to permit the air drawn in through the opening $k$ to be driven out after the manner of a rotary fan. The saw or cutting-wheel D, with its general T-shaped cutters on the periphery, serves as a fan-wheel in the end of a rotary blower and keeps a constant rush of air into the casing through the opening $k$ and out of the casing through the mouth $k'$, carrying with it the grains cut from the strings.

When it is desired to cut grains of twice the size of those cut when each cutter-socket is supplied with its cutter, each alternate cutter may be removed from its socket, thereby doubling the size of the grain without changing either the rate of feed or the rate of rotary movement of the cutter. Intermediate of their two sizes of grains various grains may be cut by diminishing the rate of movement of the cutter a predetermined amount while the rate of feed remains unchanged or increasing the rate of feed of the strings while the rate of movement of the cutter remains unchanged.

The machine as thus constructed is simple, durable, and effective, and it may be manipulated by unskilled as well as skilled labor.

What I claim is—

1. A granulating-machine, comprising a cutting-wheel provided with cutters set obliquely in its periphery with their cutting edges at the side of the wheel and means for feeding one or more strings of material into engagement with the cutters, substantially as set forth.

2. A granulating-machine, comprising a cutting-wheel provided with cutters set in the periphery of the wheel each cutter being provided with cutting edges symmetrically arranged upon opposite sides of the wheel and means for feeding one or more strings of material into engagement with the cutters, substantially as set forth.

3. A granulating-machine, comprising a cutting-wheel provided with sockets at regular intervals in its periphery, cutters provided with shanks adapted to enter the sockets in the periphery of the wheel and having cutting edges presented at the opposite sides of the wheel, means for locking the cutters in removable adjustment and means for feeding one or more strings of material into engagement with the cutters, substantially as set forth.

4. A granulating-machine, comprising a cutter-wheel, a block having one or more passage-ways extending therethrough for directing one or more strings of material to the cutting-wheel the said passage-ways being each about the size of the string of material and feed-rollers mounted in the said block in the position to feed the string or strings of material through the said passage-way or passage-ways to the cutter-wheels, substantially as set forth.

5. A granulating-machine, comprising a cutter-wheel, a block provided with one or more passage-ways for directing a string or strings of material to the cutter-wheel, feed-rollers of varying diameters mounted in the block in position to urge string or strings of material toward the cutter-wheel and a cooling-chamber for supplying a cooling liquid to the block near the passage-ways for the material being operated upon, substantially as set forth.

6. A granulating-machine, comprising a cutter-wheel provided with cutters set in its

periphery with their cutting edges at the side of the wheel, a block provided with one or more passage-ways for feeding one or more strings of material to the cutter-wheel, a stationary shear at the extremity of said passage-ways adjacent to the cutter-wheel and feed-rollers for directing the material through the passage-way or passage-ways to the cutter-wheel, substantially as set forth.

7. A granulating-machine, comprising a cutter-wheel, means for feeding one or more strings of material to the cutter-wheel, a casing surrounding the cutter-wheel and provided with an air-inlet and an air-outlet for utilizing the rotary movement of the cutter-wheel as a blower to discharge and cool the grains cut from the string or strings, substantially as set forth.

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