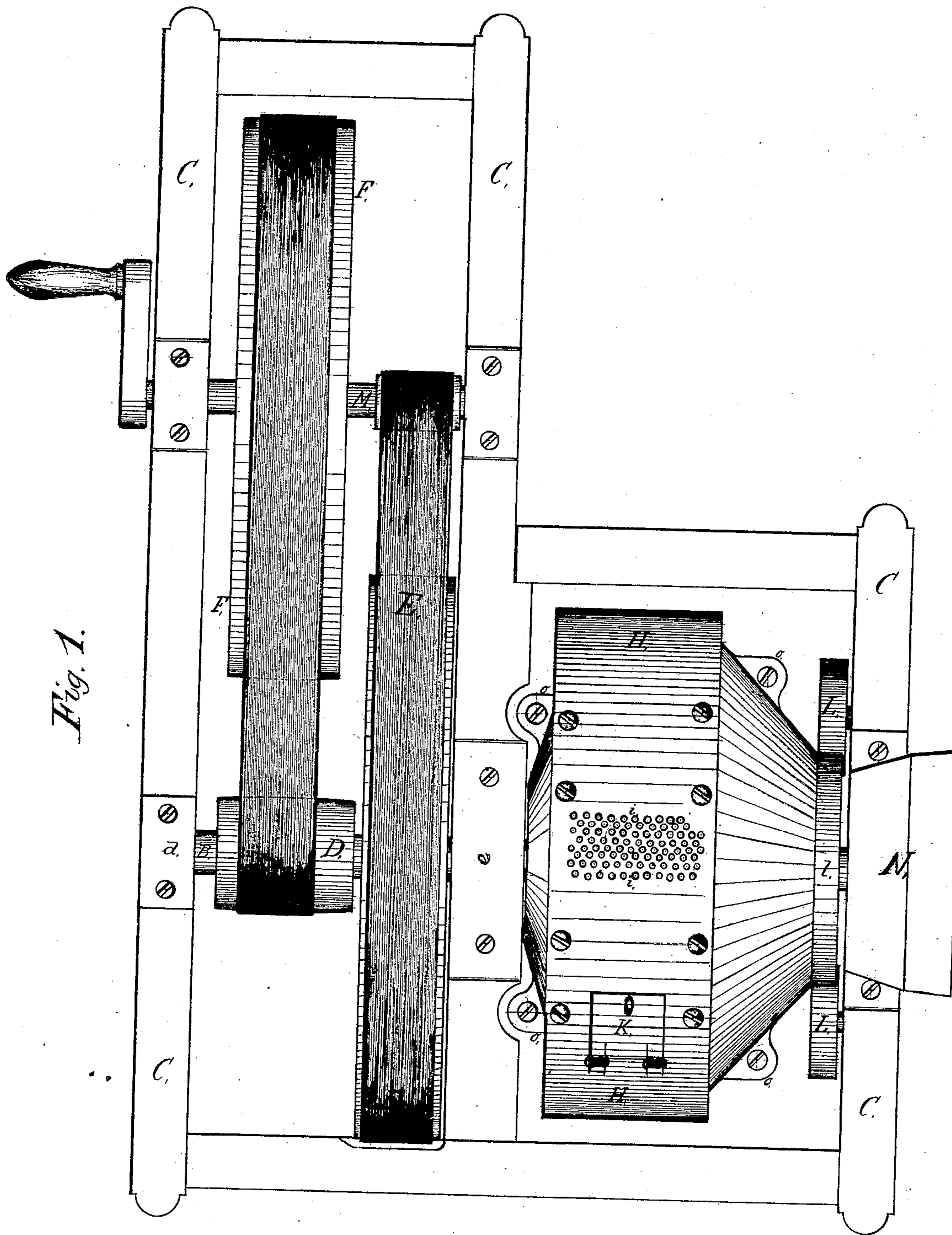


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BREAKING MACHINE.

No. 104,910.

Patented June 28, 1870.

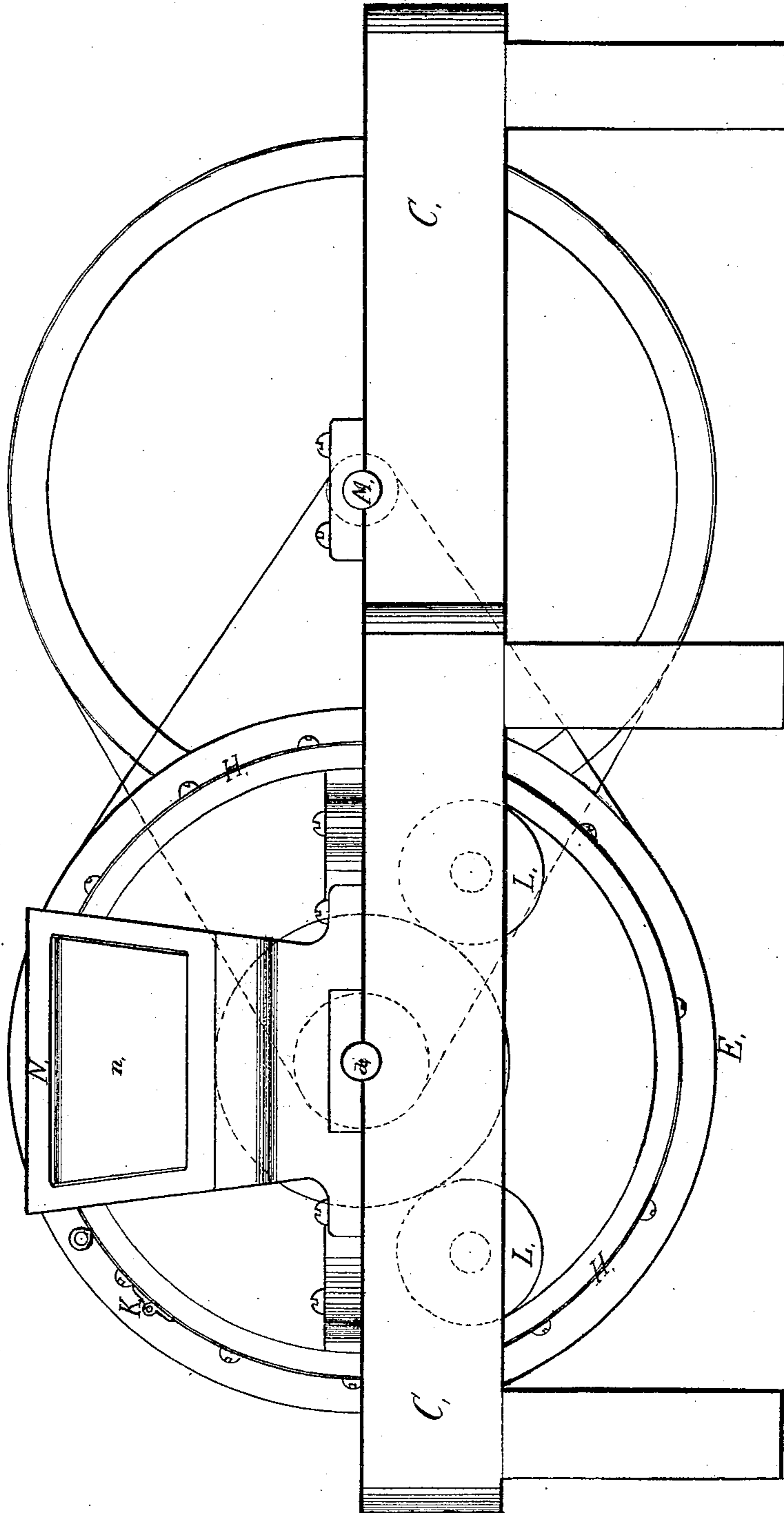


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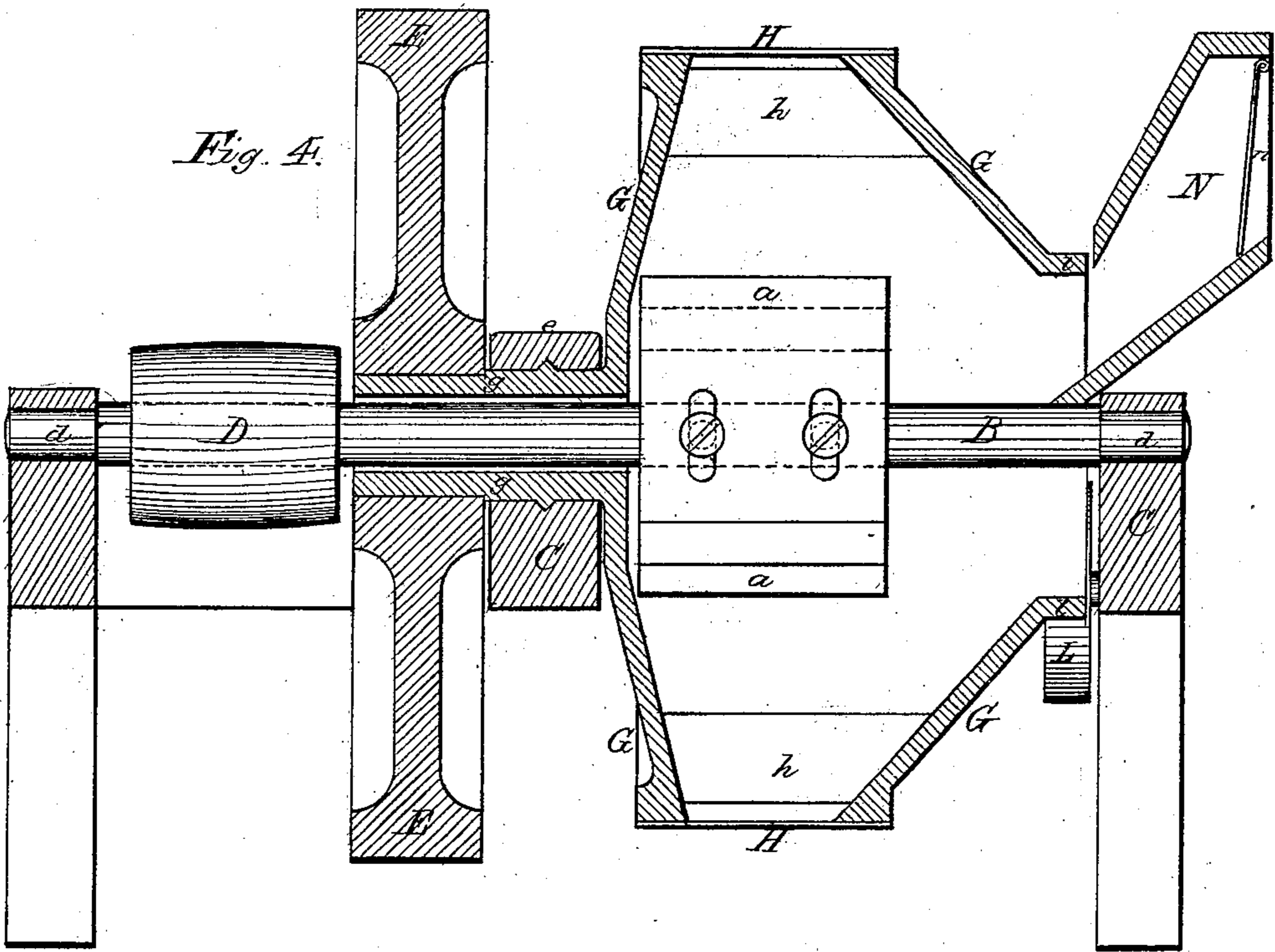
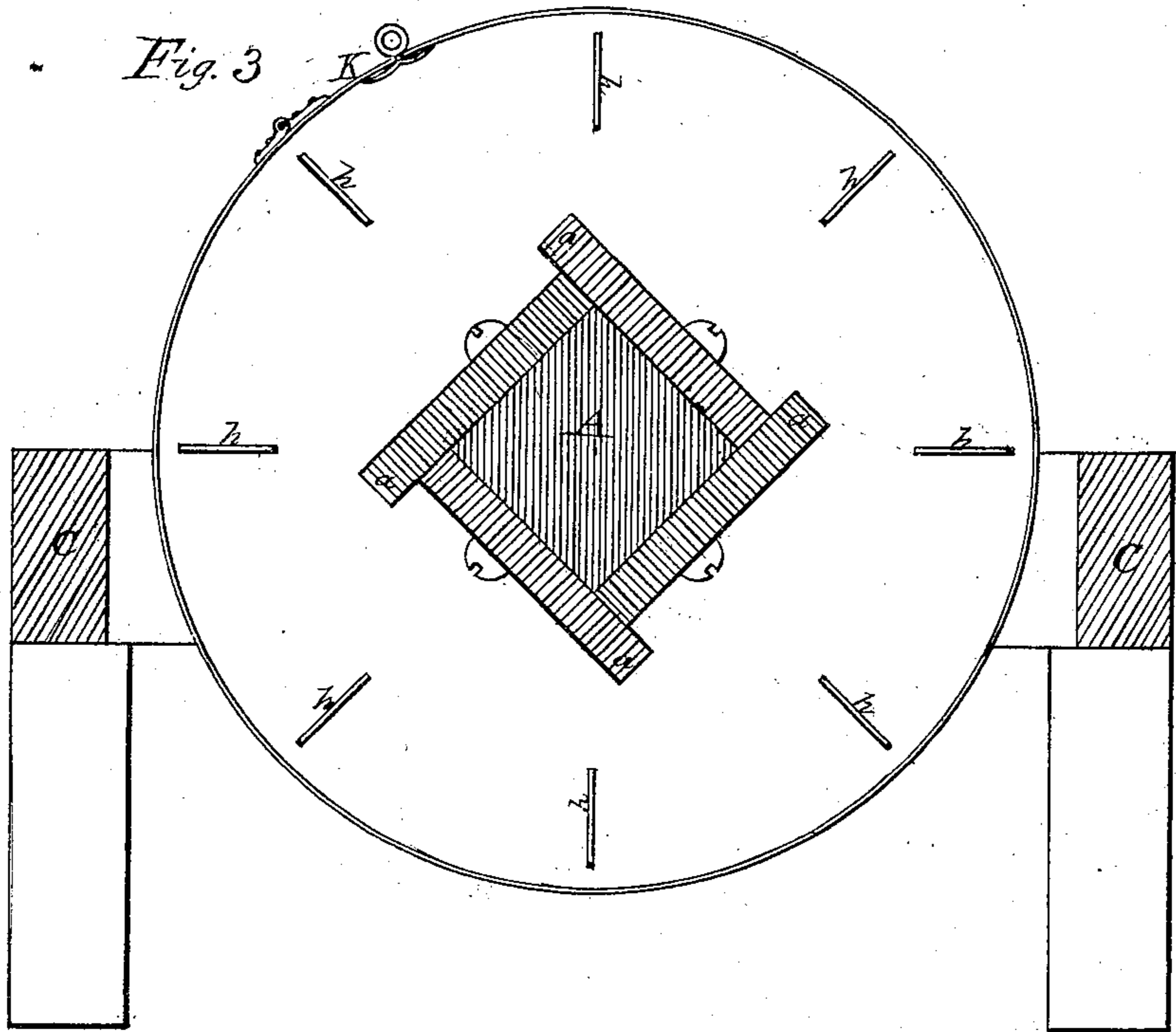
*Fig. 2.*



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# United States Patent Office.

JAMES DAVENPORT WHELPLEY, OF BOSTON, MASSACHUSETTS.

Letters Patent No. 104,910, dated June 28, 1870.

## IMPROVEMENT IN BREAKING-MACHINES.

The Schedule referred to in these Letters Patent and making part of the same.

*To all to whom these presents shall come:*

Be it known that I, JAMES DAVENPORT WHELPLEY, of Boston, in the State of Massachusetts, have invented a new and useful Breaking-Machine, which the following specification and accompanying drawings sufficiently explain.

The nature of my invention is as follows:

If a fragment of any hard or dry substance be thrown against the revolving blades of a planing-machine when it is in rapid motion, a piece will be cut or chipped away from the fragment, if it be a tough substance like wood or rubber, and if it be a brittle substance like quartz, it will be fractured, in the degree of its brittleness and the violence of the impact.

In order that this effect may be continued, the broken fragments must be gathered up and again poured upon the revolving blades.

To produce this continued action more effectually, I surround the central revolving block with a hollow cylinder, furnished on its inner surface with a series of radial plates, so that when the cylinder is slowly revolving, each of these plates shall act as a shovel-blade, collecting the scattered pieces of the broken material, and pouring them successively upon the revolving blades or block which occupy the center of the large cylinder.

The revolutions of the charging cylinder will not exceed sixty per minute, and will be preferably less than that, in order to avoid the effect of centrifugal force, which would prevent the fall of the material upon the block or blades.

The cylinder will be made, preferably, of sheet or plate-iron, pierced with holes, through which the finely-broken material may escape.

Figure 1 gives a bird's-eye view of the machine with its parts in mechanical combination.

Figure 2 is a lateral view of the same.

Figure 3 is a sectional view through the charging-cylinder and the central revolving blades.

Figure 4 is a sectional perpendicular view, showing the relation of the shaft, pulleys, and bearings.

F F, fig. 1, is a driving-wheel, supported by a shaft, M, which, by means of the band and pulley D, gives rapid revolution to the block of metal A, fig. 3, centrally pierced and supported by the iron or steel shaft B, fig. 4, which supports four blades, *a a a a*, fastened in any convenient manner to the block; the corners of the blades, preferably of chilled metal or steel, acting as cutters and breakers upon the material poured upon them by the revolving buckets or shovel-blades *h h h*.

The dimensions of the block A may vary from six to eighteen inches in diameter, and from twelve to eighteen in length, more or less.

The edges of the blades *a a*, bolted onto the block, will be beveled to a more or less cutting-edge accord-

ing to the nature of the substance to be cut or broken.

If a material like rubber or hard wood is to be comminuted, the edges of the blades will be beveled like those of the wood-planer. These various inclinations cannot of course be represented in the drawings.

I do not offer any particular method of fastening the cutters to the block A; they may be let into dovetail grooves fastened with keys, or otherwise, or may be attached radially by face-bolts; they may vary in number from two upward, according to the size of the machine and the work proposed.

The block itself, made of hard metal, might, under certain conditions for a rude species of work, be made of surface-chilled metal, cast solid with cutting or breaking-ridges or projections.

The charging-cylinder, with its shovel-blades *h h*, of strong boiler plate or thick sheet-iron, perforated with holes *i i*, so as to have the character and action of a screen, will be furnished with a hinged door, K, to remove pieces of iron or other obstructions which may chance to fall into the cylinder. The charging-cylinder will accomplish its work revolving in either direction about the central block. Its cylindrical form is maintained and it is supported in position by two cast-iron cylinder-heads, G G G G, fig. 4, to which it is attached by peripheral screws.

The cylinder-head on the side in contact with the hopper N, figs. 2 and 4, has an expanded hollow neck or opening, *l l*, figs. 4 and 1, supported upon two friction-rollers, L L, the shafts or pins of the rollers supported by the frame C, figs. 1, 2, 3, 4.

A hopper, N, with a hinged door, *n*, opening inward, rests upon the frame, in communication with the large openings or neck of the cylinder-head, where it rests between the friction-rolls L L; through this hopper and opening the material to be comminuted is fed into the charging-cylinder, to be carried slowly round therein and precipitated successively by the shelves or buckets *h h* upon the revolving block A.

The opposite cast-iron head of the charging-cylinder is extended to form a bearing in the form of a hollow cast or wrought-iron tube, *g g*. Through this hollow neck or tube, which rests revolving upon the middle division of the frame C in a box with a cap, *e*, figs. 1 and 4, carrying at its extremity a large pulley, E E, figs. 1 and 4, by means of which a slow motion or revolution is given to the charging-cylinder, the shaft B passes free, without contact, and may receive a rapid motion of from one to three thousand revolutions per minute, more or less, according to the nature of the work to be performed, while the slow motion of the charging-cylinder is only sufficient to raise the material, and discharge it from the shelves *h h* upon the revolving block A by its own weight, as it would be thrown by a shovel.

The charging-cylinder takes no part in the breaking

or cutting of the material, being too far removed from it to have any such action. It may be five feet in diameter, while the block, with its blades, is only eighteen inches.

The shelves or buckets *h h* may be from six to eight inches in breadth from without inward, and a space of an inch, more or less, should intervene between these blades and the charging-cylinder itself, in order that the screening process may not be interrupted by the outer edges of the shelves.

The motion of the charging-cylinder in revolution must be so slow as not to interrupt the sliding of the broken material upon the interior surface of the charging-cylinder, and the consequent screening process.

The two heads of the charging-cylinder are cast in halves and bolted together by means of ears and bolts *o o*, fig. 1.

The driving machinery, which gives motion to the bands and pulleys *D* and *E* with differing velocities, as explained, is represented in the drawings as resting upon the frame *C*, but will be preferably placed at a distance of fifteen or twenty feet therefrom, for reasons which will be obvious to every practical machinist.

In the patent of Howell, No. 37,322, dated January 6, 1863, I find the following concise description of the invention and its principle of action:

"In this machine the ore is introduced between a rapidly-revolving disk and an inclosing case. The edge of the disk is armed with teeth or projections, and violently projects the ore against the stationary case, and thus shatters it.

"Claim, reducing minerals, bones, and similar substances to powder by percussion, substantially as described; that is to say, by means of a rotating projector, and an impinging surface, both inclosed in a case, the relations of the rotating projector and the impinging surface being such that the materials will not be pulverized by being crushed between them, but only by the percussion resulting from the sudden checking of the motion given to the materials by the one against the surface of the other, substantially as described."

The mechanical effect of the device of Howell is obtained by investing a central disk furnished with paddles or projections, with a fixed and very substantial cylindrical case, at a distance of from two to four inches from the projections. The material thrown into the investing cylinder, in depth sufficient to be reached, is dashed with violence against the interior face of the fixed inclosing cylinder with the effects described.

The purpose of the invention described in this present application is to accomplish the work of comminution or of cutting, by the central revolving apparatus alone, imitating therein the action of the revolving blades of a planing-machine; feeding or delivering the material by an independent movement accomplished by a distinct mechanism. The material which is not broken fine enough to pass through the revolving cylinder screen is gathered up as it is thrown from the central revolving block by concussion, by

means of a series of buckets or scoops, furnished with perforated backs connected together in the form of a screen; a structure which renders it impossible for any part of the breaking or comminuting work to be accomplished otherwise than by the central revolving block. Neither can this block be, as described in the Howell machine, a "disk with projections," but must be a solid block, having a minimum length nearly equal to its diameter, and as much longer as may be desired, and removed to a sufficient distance from the buckets to prevent a destruction of these latter by the reaction of broken material.

The backs of the buckets, forming a connected screen, may be of perforated plate or of strong iron-netting, according to the work to be performed.

Crushing-machines have been used with two cylinders both in revolution, the purpose being in this case to augment the quantity of work done by giving a rapid movement as well to the outer as inner cylinder, but the use of the revolving block in combination with charging buckets and screen back, the two latter having a slow combined motion suitable for charging and screening, has not hitherto been employed as a mechanical device for the purposes described. Since the effects of sudden percussion and cutting are effects perfectly well understood and applied in the planing-machine, the novelty and utility of my invention consists in the simultaneous screening of the material and free delivery of the coarser particles back upon the block or blades, and not in the use of the revolving block with blades upon work which is fixed and carried forward, as it is, by the supporting rollers of a planing-machine. The novelty consists in the manner of its use and the nature of the materials, irregular fragments to be broken or divided.

In the patent of Sundell, No. 53,237, March 13, 1866, a revolving screen is used, but not the charging-buckets in connection therewith; nor is any central revolving block described with or without cutters. In this invention, also, the slats of which the revolving cylinder is made act as breakers.

What I claim, and desire to secure by Letters Patent, is—

1. The combination of the revolving cutting-block *A* with the perforated revolving charging-cylinder *H*, constructed substantially as herein described, and for the purposes set forth.
2. The combination of block *A* with revolving cylinder *H*, provided with shelves or buckets *h h*, attached to the two heads, substantially as shown and for the purposes set forth.
3. The arrangement of cylinder *H*, having buckets *h h*, neck *g g*, supported on rollers *L L*, and block *A*, all as herein described, and for the purpose set forth.
4. The cutting-block *A*, provided with adjustable cutters *a a*, by means of slot and screens, substantially as herein shown and for the purpose set forth.

JAMES D. WHELPLEY.

Witnesses:

JACOB J. STORER,  
CHARLES M. NICKERSON.