4 Sheets—Sheet 1.

J. D. BRUNTON & F. H. J. TRIER.

Stone-Dressing Machine.

No. 212,182. **Patented Feb. 11, 1879.**

FIG. I.

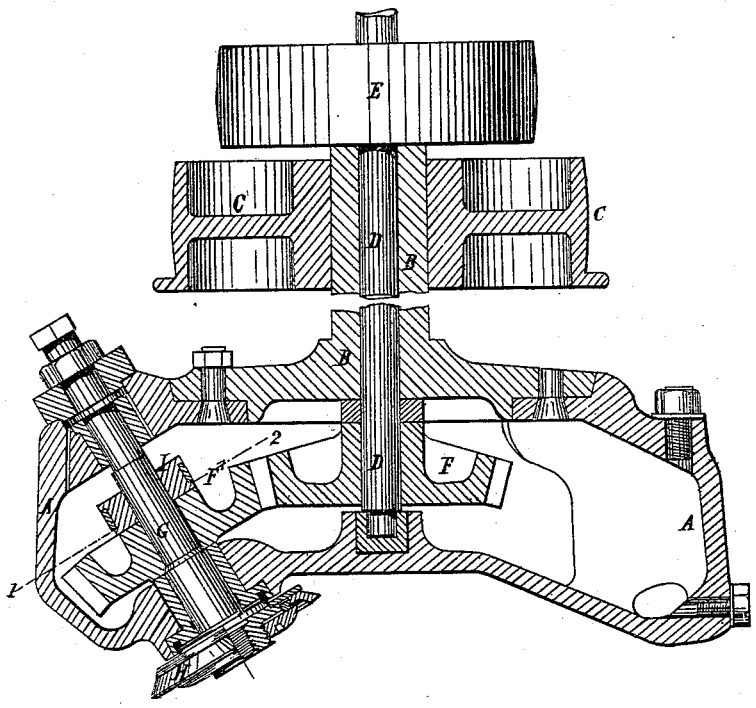
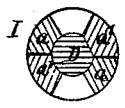


FIG. II.



Witnesses,
Harry A. Crawford.
Hardy Smith

Inventor
John D. Brunton
and
Frank H. J. Trier
by their Attorneys
Howson and Son

4 Sheets—Sheet 2.

J. D. BRUNTON & F. H. J. TRIER.

Stone-Dressing Machine.

No. 212,182. Patented Feb. 11, 1879.

FIG. 2.

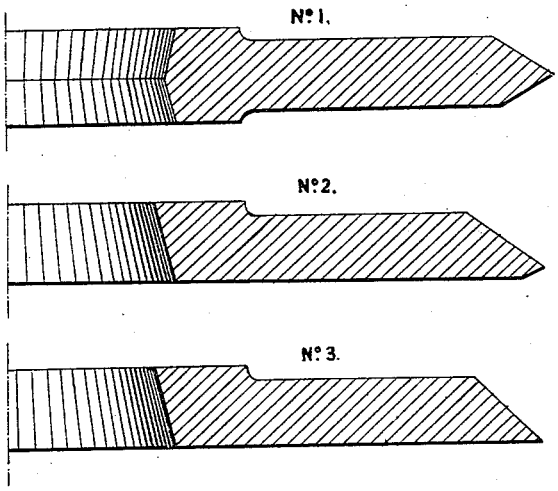


FIG. 3.

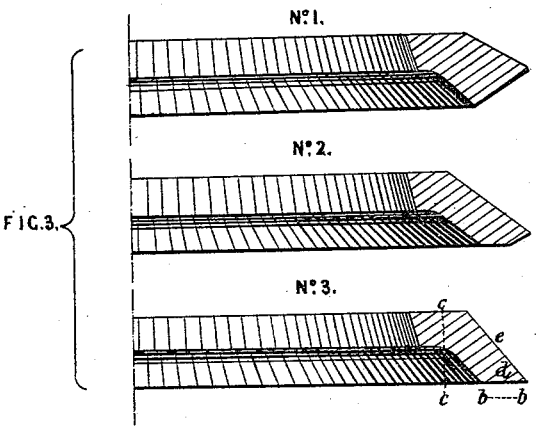
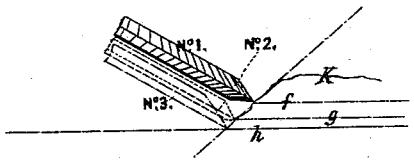


FIG. 4



Witnesses,
Harry A. Crawford.
Harry Smith

Inventor,
John D. Brunton
and
Frank H. J. Trier
by their Attorneys
Howson and Son

4 Sheets—Sheet 3.

J. D. BRUNTON & F. H. J. TRIER.

Stone-Dressing Machine.

No. 212,182. Patented Feb. 11, 1879.

FIG. 5.

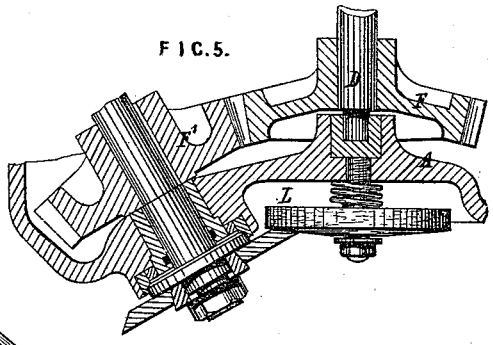


FIG. 6.

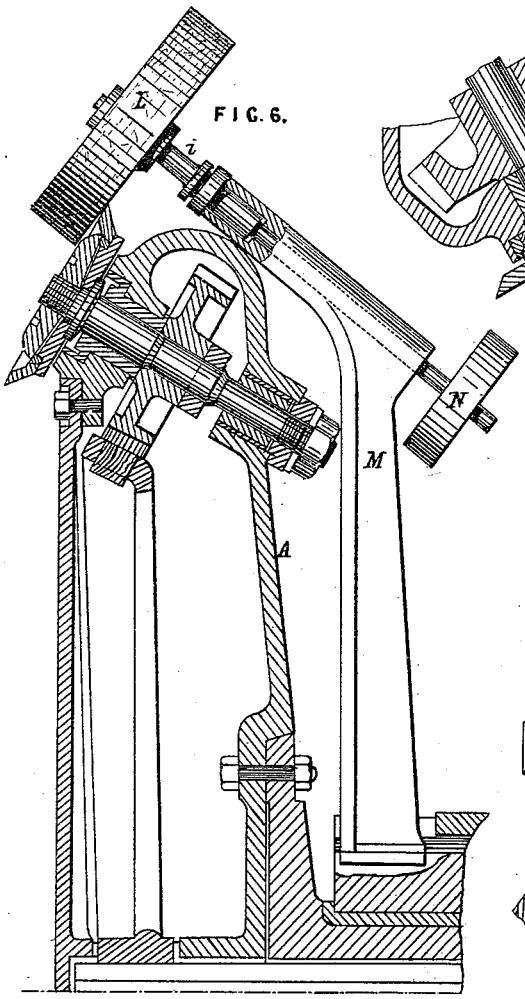
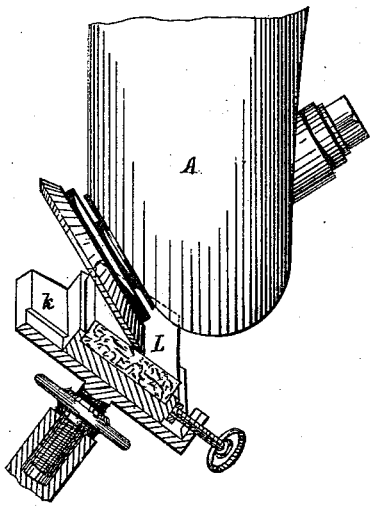


FIG. 7.



Witnesses,
Harry A. Crawford
Harry Smith

Inventor
John D. Brunton
and
Frank H. J. Trier
by their Attorneys
Howson and Howson

4 Sheets—Sheet 4.

J. D. BRUNTON & F. H. J. TRIER.

Stone-Dressing Machine.

No. 212,182. Patented Feb. 11, 1879.

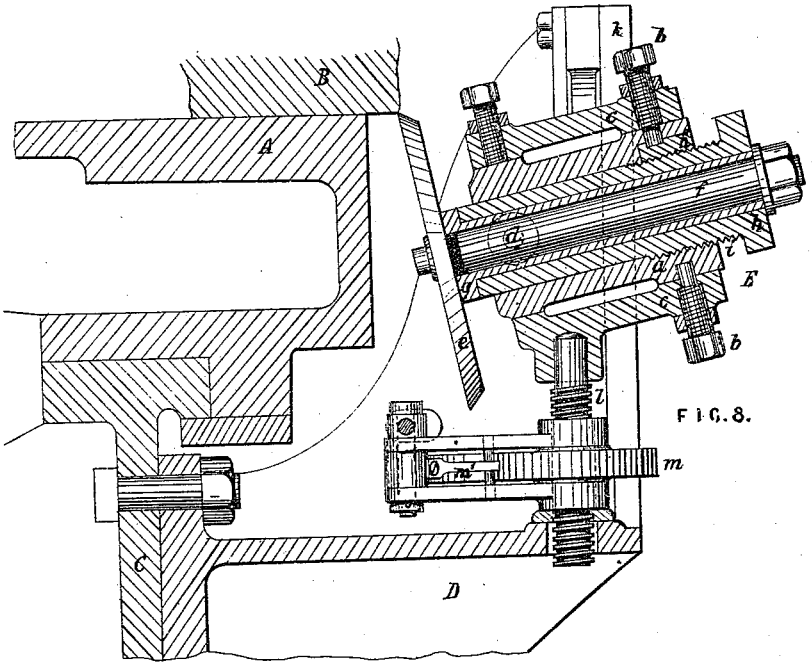


FIG. 8.

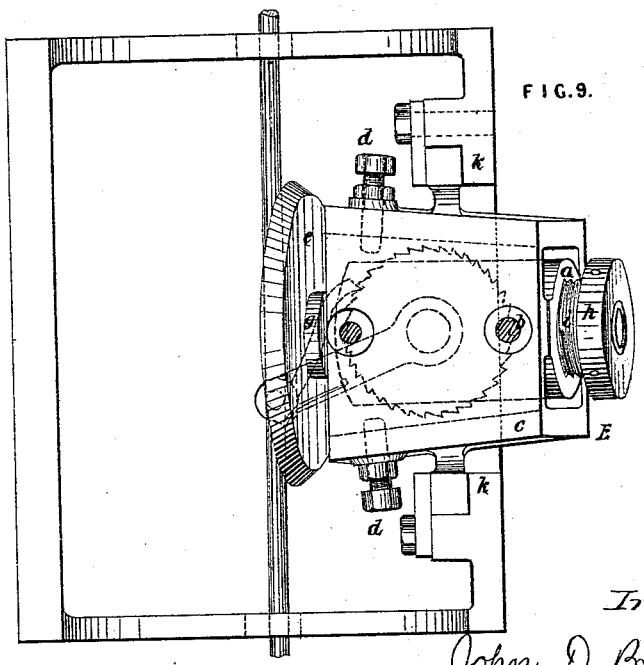


FIG. 9.

Inventors,
John D. Brunton
and
Frank H. J. Trier
by their Attorneys
Howson and Son

Inventors,
Harry A. Crawford
Harly Smith

UNITED STATES PATENT OFFICE.

JOHN D. BRUNTON AND FRANK H. J. TRIER, OF BATTERSEA, ENGLAND.

IMPROVEMENT IN STONE-DRESSING MACHINES.

Specification forming part of Letters Patent No. **212,182**, dated February 11, 1879; application filed June 24, 1878.

To all whom it may concern:

Be it known that we, JOHN DICKINSON BRUNTON and FRANK HENRY JULIUS TRIER, both of Battersea, in the county of Surrey and Kingdom of England, engineers, have invented improvements on machinery or apparatus for cutting rock and dressing, shaping, planing, and turning stone, of which the following is a specification:

Our invention relates to improvements on the construction of circular revolving cutters, and the method of applying the same to the cutting of rock and the dressing, shaping, planing, and turning stone, and the method of grinding or sharpening the said cutters; and consists, first, of a mode of rendering circular cutters self-adjustable (within certain limits) when they are driven in the manner described in the specification to former Letters Patent for the United States of America granted to the said John Dickinson Brunton, dated the 14th November, 1876, No. 184,330; second, in constructing the said cutters in the form of a conical ring of the minimum thickness consistent with strength and the maximum depth practicable, so as to admit of the cutter being ground with facility upon its end face or base in lieu of upon its conical periphery, as is the case with the thin leveled disks hitherto employed; third, in so arranging a series of inclined cutting-disks on a rotary chuck, with mechanism for imparting a positive rotary motion to said disks on their own axes, that as the chuck rotates each cutter will operate on the stone in a different plane or at a different depth in respect to the surface to be dressed; fourth, of an arrangement whereby we bring the grinding-action of stone, emery, or other suitable grinding substance to bear upon the circular cutters while they are in operation, so as to maintain the cutting-edges constantly in a state best fitted for dressing stone; fifth, of an arrangement of a circular rotating cutter, in connection with and as an adjunct to the machine with revolving chuck known as "Brunton's stone-dressing machine," for the purpose of producing more perfect arrises on stone dressed in the said machine.

And in order that our said invention may be fully understood, we shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same letters of reference indicating corresponding parts in all the corresponding figures.

Figure 1, Sheet 1, represents a section of a chuck with the improvements which form the subject of the first and second parts of our said invention applied thereto, and Fig. 1ª is a horizontal section taken along the line 1 2 in Fig. 1. Figs. 2, 3, and 4 on Sheet 2 illustrate a mode of carrying out the third part of our said invention, Figs. 2 and 3 representing, respectively, sections of two modifications of cutters, and Fig. 4 being a diagram, showing their operation. Fig. 3 also further illustrates the second part of our invention. Fig. 5 on Sheet 3 is a vertical section of a portion of a chuck having applied thereto the improvements which form the subject-matter of the fourth part of our said invention, according to one mode of carrying out the same, and Figs. 6 and 7 are sectional elevations, illustrating, respectively, two other modifications. Figs. 8 and 9 on Sheet 4 represent, respectively, a sectional elevation and plan of a portion of a machine constructed and arranged in accordance with the fifth part of our invention.

The first part of our said invention, which relates to means for providing for the self-adjustment, within certain limits, of circular cutters, when driven in the manner hereinbefore referred to, is illustrated by Figs 1 and 1ª, although it is also applicable to the other modifications of chuck described in the specification to the said former Letters Patent.

A is the body of the chuck, secured to a hollow shaft, B, on which is mounted a driving-pulley, C, for imparting motion to the chuck, while through the hollow shaft B passes a shaft, D, carrying a driving-pulley, E, for imparting motion to the latter, and, through the inclosed gearing F F′, transmitting motion to the arbors of the series of cutters H, one only of which is shown in the drawings, and thus imparting a positive rotation to the said cutters, the speed of which, relatively to that of the chuck, may be controlled and adjusted as required.

The apparatus as thus constructed forms in part the subject-matter of the said former Letters Patent.

According to our present invention we em-

ploy a clutch-connection between the toothed wheel F′ or roller surrounding the cutter-arbor G and the arbor itself, the wheel F′ or roller being fitted loose upon the arbor, but provided with projections *a a*, (see Fig. 1ª,) which correspond to and engage with other projections *a′ a′* on a ring or collar, I, formed on or keyed or otherwise secured on the arbor in such a manner as to carry the arbor round with it, but at the same time to admit of the arbor revolving with an accelerated rotative motion through a greater or less arc if the contact of the circular cutter mounted upon the arbor with the surface of the stone or rock operated on shall impel it in the fulfillment of a more exact rolling action.

The second part of our invention, which is illustrated by Figs. 1 and 3, consists in constructing the cutters in the form of a conical ring of the minimum thickness in the direction *b b* consistent with strength and of the maximum depth in the direction *c c* practicable, so as to admit of the cutter being ground with facility upon its end face or base *d* in lieu of upon its conical periphery *e*, as is the case with the thin leveled disks hitherto employed—such, for example, as are shown in Fig. 5.

The third part of our invention, which is illustrated by Figs. 2, 3, and 4, Sheet 2, of our drawings, relates to a mode of arranging in combination several circular cutters in a chuck or tool holder, in such a manner as that they shall in their combined action operate on the stone upon different planes or at different depths. In carrying out this part of our said invention we employ, say, for example, three cutters, No. 1, No. 2, and No. 3, which may either consist of thin disks, as shown in Fig. 2, or be constructed in the form of conical rings, as hereinbefore described under the second head of our said invention, and illustrated by Fig. 3. The cutters No. 1, No. 2, and No. 3 are each mounted on a separate arbor in one and the same chuck, in the manner hereinbefore described with reference to the arrangement shown in Fig. 1; but they are placed in such relative positions on their respective arbors that the cutter No. 1, which first comes into action, operates upon the upper surface of the stone, that the cutter No. 2, which follows it, acts upon the surface below, while, finally, the cutter No. 3, which is the finishing-cutter, completes the operation. The action of the cutters, which are made of a shape adapted to the functions which they are severally required to perform, will be clearly understood by reference to the diagram, Fig. 4, in which the dotted lines *f g h* represent, respectively, the depth of cut of the several cutters Nos. 1, 2, and 3 on the stone K.

By this arrangement, first, beneficial application is made of the principle that the overlying thickness of stone tends to cause the fracture produced by the chipping action of all the cutters except those in the highest rank to take an upward or outward direction relatively to the face of the stone, and thus to prevent what is technically known as "plucking"; and, secondly, the advantage is gained that, except in the case of the lowest rank, which may be called the "finishing-cutters," the body of the stone under the edge of each rank of cutters is in great part or altogether removed by the action of the rank next below it, and by this means the face-pressure and attrition, which are greatest at this point, are obviated or considerably diminished.

Our invention relates, fourthly, to an arrangement by which we bring the grinding action of stone, emery, or other suitable grinding substance to bear upon the circular cutters while they are in operation, so as to maintain the cutting-edges constantly in a state best fitted for dressing stone. This part of our said invention is illustrated in Figs. 5, 6, and 7, Sheet 3, of our drawings.

In the case of cutters so mounted on a chuck as to cut exteriorly, we place a grinder, L, against the face of the chuck A, as shown in Fig. 5, so as to act simultaneously on all the cutters carried by it, and the grinder may either be fixed to the chuck, as shown, and rotate with it, or be mounted on an axis and have a separate motion.

In the case of a chuck having its cutters so mounted as to act interiorly, we place the grinder in a position such that each cutter during a portion of its revolution as it is carried round by the rotation of the chuck shall come into contact with its surface.

Two modifications of this arrangement—viz., Figs. 6 and 7—are shown in our drawings. In the modification shown in Fig. 6 the grinder L is mounted upon a spindle, *i*, working in bearings in an arm or bracket, M, which may be fixed to the standard or frame of the machine or secured in any other convenient place and manner.

The grinder L may be stationary; but we prefer to impart to it a rotatory motion, for which purpose a pulley, N, is provided.

According to the modification illustrated by Fig. 7, the grinder L consists of a segment of a ring, which may be of any required length, carried on a slide or holder, *k*.

In all the examples illustrated the grinder is capable of such self-adjustment to the surfaces to be ground as its wear and the wear of the cutters will render necessary, the mode of effecting which adjustment will be readily understood from the drawings without further explanation.

The grinder, in lieu of being stationary or rotating in one direction, may have imparted to it a reciprocating motion, either rotatory or otherwise, if desired.

The fifth part of our said invention relates to an arrangement of circular rotating cutter to be employed in connection with the machine known as "Brunton's stone-dressing machine," for the purpose of producing more perfect arrises in stone dressed in the said machine, and is illustrated by Figs. 8 and 9 of the drawings.

A is the traveling table of the machine, on which is fixed the stone B, for the purpose of being dressed by the revolving chuck. C is the fixed bed of the machine, to which, at some convenient point, is bolted or otherwise secured the bracket D, which carries the tool-holder E. This tool-holder consists of a socket, *a*, set at an inclination of about twelve degrees to the face of the stone to be operated on, pivoted on two pins, *b b*, and having freedom for a small lateral movement within the inclosing-piece *c*, the extent of which lateral movement is adjustable by set-pins *d d*.

e is the arris-cutter, which is held by the bolt *f* to the sleeve *g*, and revolves with it in the bearing *h*, the latter being prevented from revolving by a key, *h'*, or pin, but capable of being screwed forward to regulate the depth of the cut by means of the thread or screw *i*, formed upon it and screwing into the socket *a*.

The tool-holder E has a vertical motion in the guides *k k* of the bracket D, and can be raised or lowered by the screw *l*, which is operated by a toothed wheel, *m*, and pawl *m'*, or in any other convenient manner.

The table and stone are caused to move to and fro as fast as is practicable. The edge of the cutter is brought into contact with the stone, and by the contact is caused to revolve. The movement of the stone against the cutter also causes the socket *a* to move laterally in the piece *c* to the extent permitted, and thus to take a position slightly askew of the plane of the face of the stone. On the return of the stone the socket *a* moves laterally in the other direction, and thus the skew is reversed, to correspond to the reverse motion of the stone. The cutter acts on the stone as it moves in both directions, and after each traverse of the stone is raised upward by the action of the screw *l* to the extent of feed required.

Having now described and particularly ascertained the nature of our said invention, and the manner in which the same is or may be used or carried into effect, we would observe, in conclusion, that we do not claim, generally, the use of circular cutters; nor do we claim, generally, imparting to circular cutters a positive rotary motion on their own axes and independent of the rotation which they would otherwise derive from their contact with the stone under operation; neither do we claim, broadly, the use of multiple cutters in one and the same chuck, nor the use of grinding apparatus, except in the manner and for the objects of our invention; but

What we consider to be novel and original is—

1. In a stone-dressing machine, the combination of the arbor carrying the rotary cutters with gear-wheels and an intermediate clutch, constructed substantially as described, to allow a slight play between said arbor and its driving-wheel, substantially as and for the purpose set forth.

2. A stone-dressing cutting-disk consisting of a conical ring of the least practicable thickness in the direction *b b* and of the greatest practicable depth in the direction *c c*, whereby said cutter may be ground on the base *d*, as described.

3. The combination of a rotary chuck carrying a series of inclined cutting-disks with mechanism for imparting a positive rotary motion to said disks on their own axes, the disks being so arranged on said chuck that as the latter rotates each cutter will operate on the stone in a different plane, or at a different depth in respect to the surface to be dressed, as specified.

4. The combination of a chuck carrying a series of cutting-disks, to which a positive rotary motion is imparted, with an emery or other grinding-wheel adapted to come in contact with the edges of the several cutters in succession, as set forth.

5. The combination, in a stone-dressing machine, of cutters for dressing the surface of the stone with an arris-cutter, the axis of which is mounted in a pivoted adjustable socket, substantially as described.

In witness whereof we have signed our names to this specification in the presence of two subscribing witnesses.

JOHN DICKINSON BRUNTON.
FRANK HENRY JULIUS TRIER.

Witnesses to the signature of the said John Dickinson Brunton:

WM. JOHN WEEKS,
9 *Gracechurch Street, London.*
CHAS. MILLS,
47 *Lincoln's Inn Fields, London.*

Witnesses to the signature of the said Frank Henry Julius Trier, (commonly known as Frank Trier:)

JULES DRETZ,
13 *Rue de Castellar, Paris.*
ROBT. M. HOOPER.