(No Model.) 3 Sheets—Sheet 1.

# G. RICHARDS.

## GRINDING MACHINE.

No. 332,003. Patented Dec. 8, 1885.

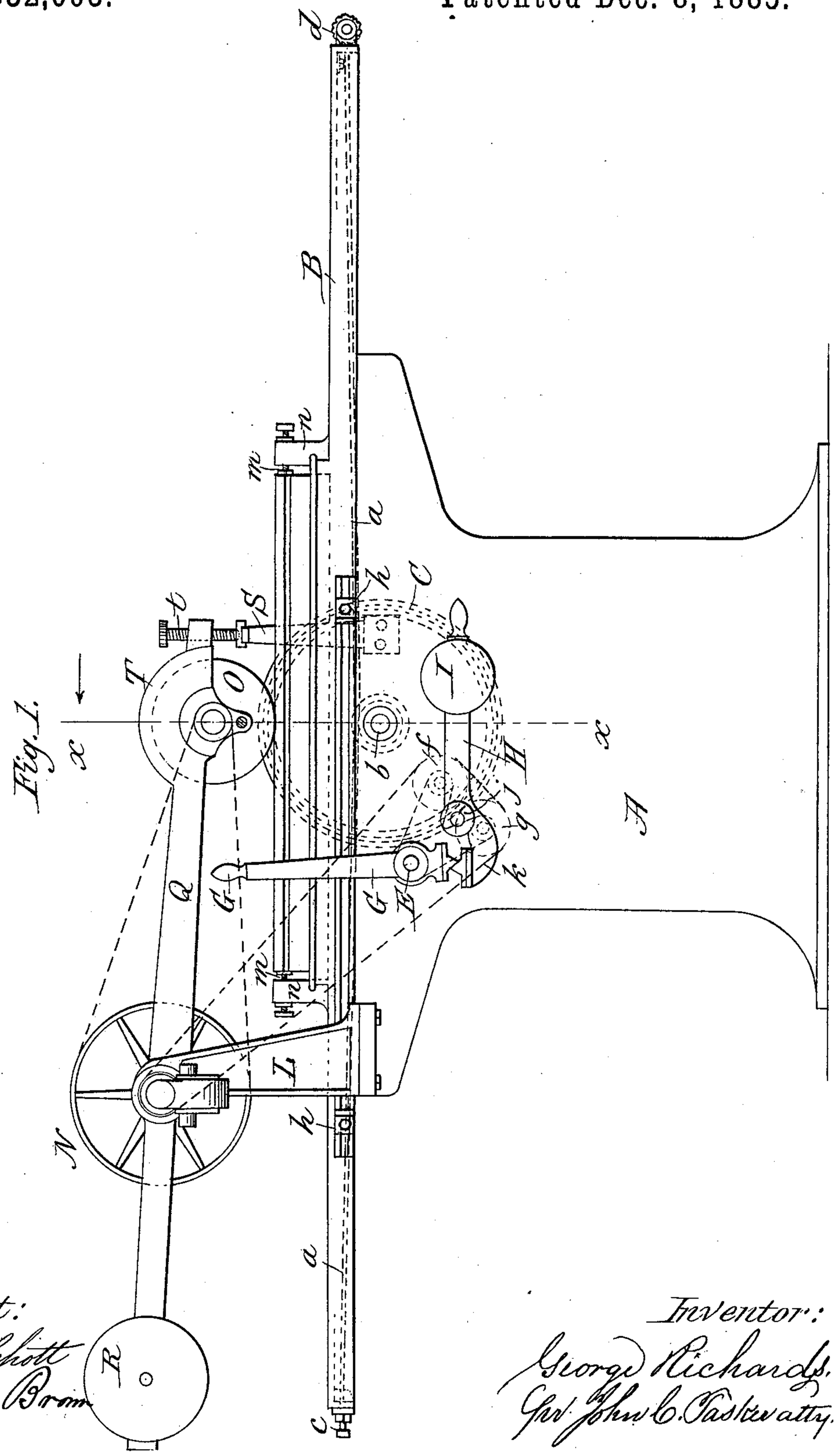



Fig. 1.

Attest:
F. H. Schott
A. R. Brown

Inventor:
George Richards.
per John C. Fasterwatty.

(No Model.) 3 Sheets—Sheet 2.

# G. RICHARDS.

## GRINDING MACHINE.

No. 332,003. Patented Dec. 8, 1885.

Fig. 2.

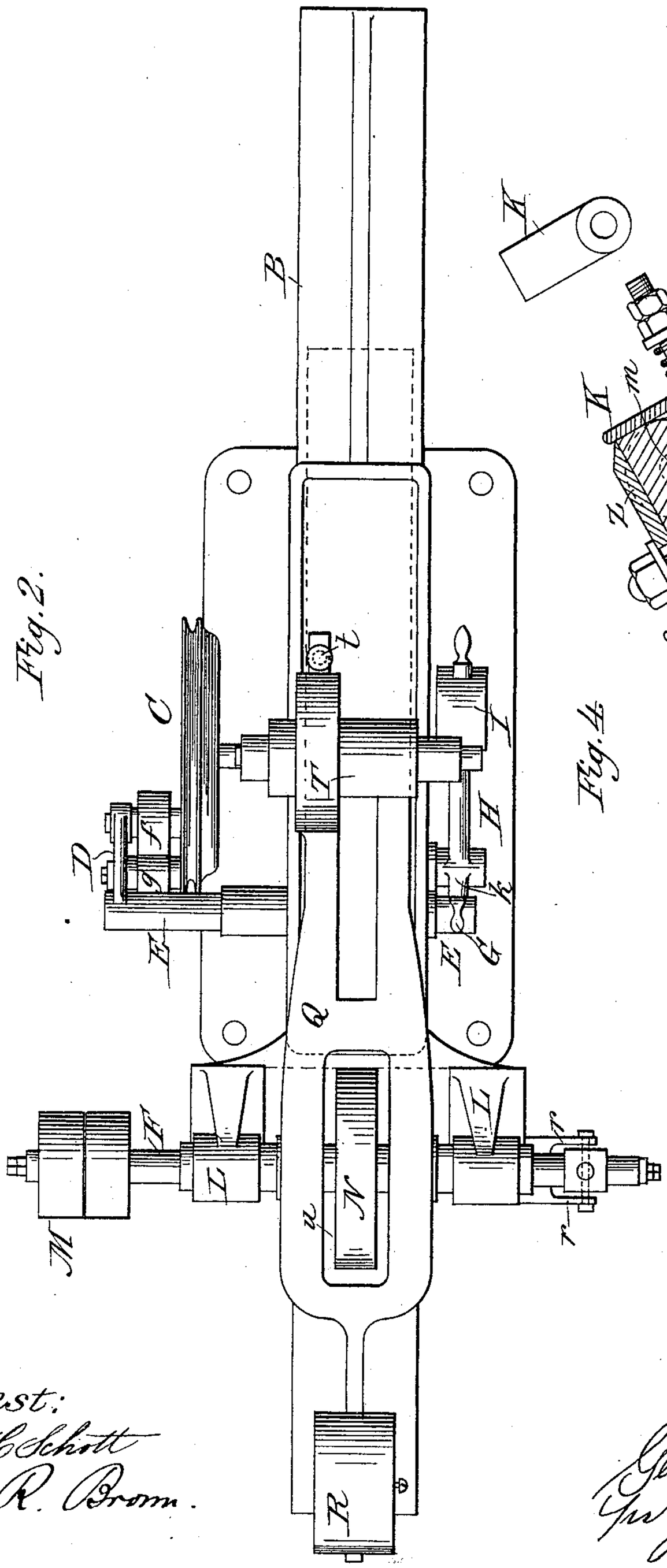
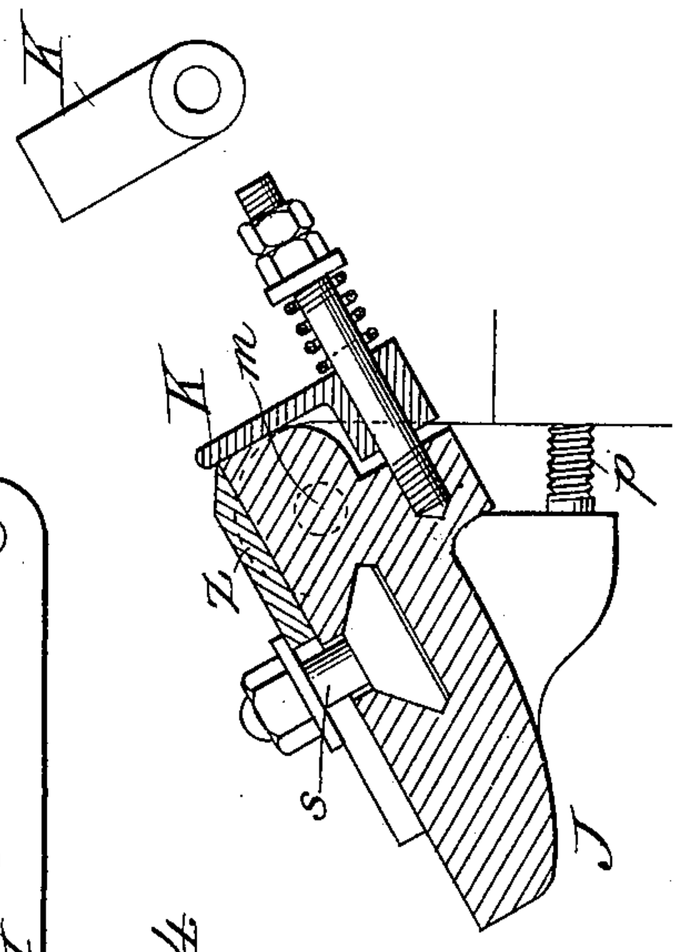



Fig. 4.




Attest:
F. H. Schott
A. R. Brown.

Inventor:
George Richards,
per John C. Tasker

(No Model.)

3 Sheets—Sheet 3.

# G. RICHARDS.

## GRINDING MACHINE.

No. 332,003. Patented Dec. 8, 1885.

*Fig. 3.*

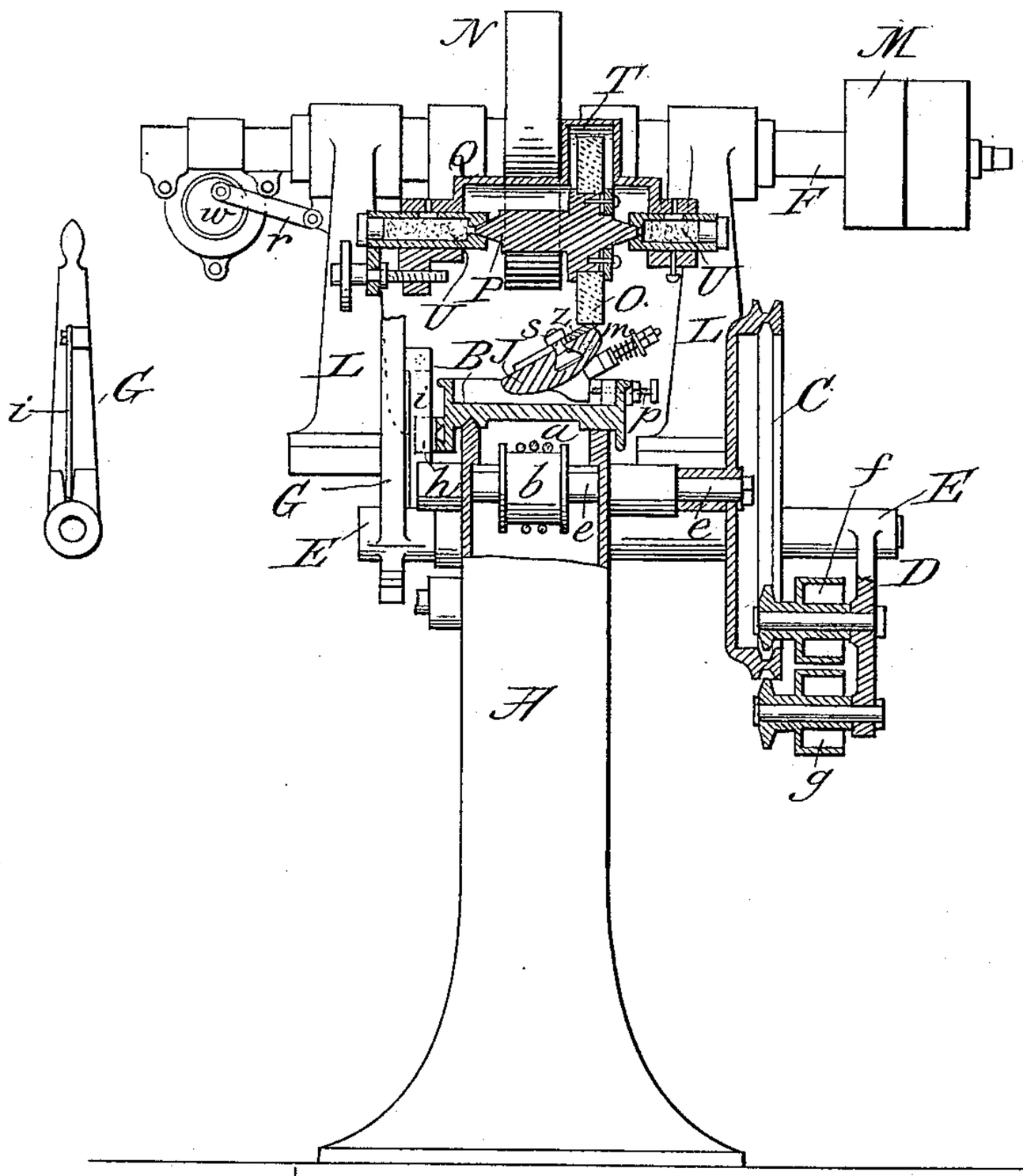



*Fig. 5.*

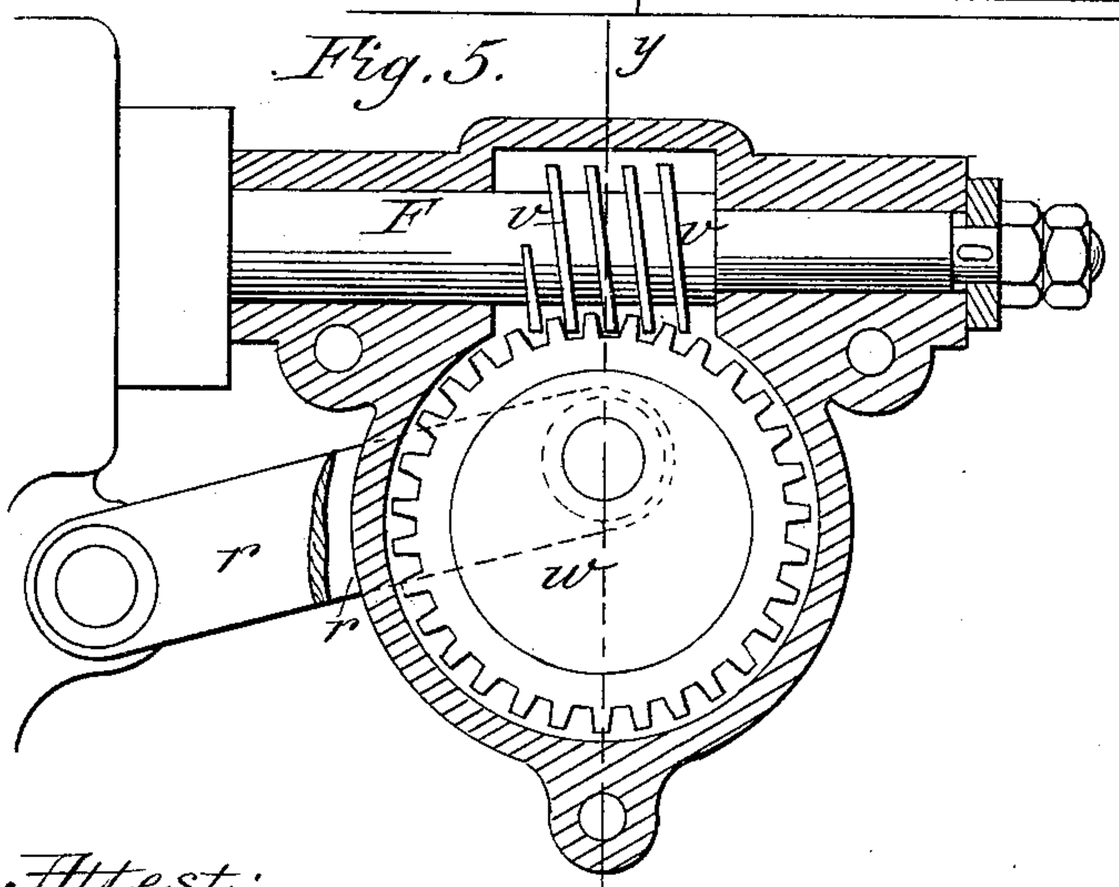
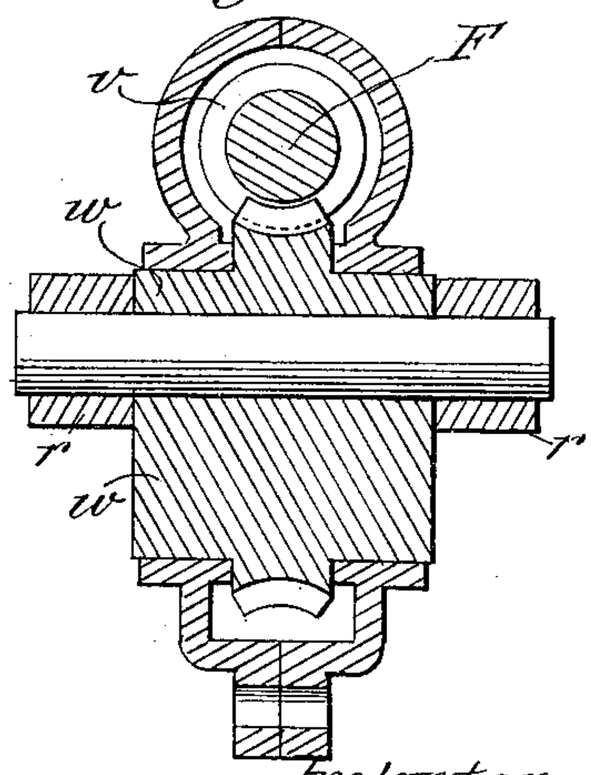



*Fig. 6.*




Attest:

F. H. Schott

N. R. Brown.

Inventor:

George Richards.

per John C. Taskwatty

# UNITED STATES PATENT OFFICE.

GEORGE RICHARDS, OF MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

## GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 332,003, dated December 8, 1885.

Application filed October 20, 1884. Serial No. 145,967. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE RICHARDS, a citizen of the United States, residing at Manchester, England, have invented certain new and useful Improvements in Grinding-Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to improvements in machines for grinding planer knives or cutters, and similar edge-tools.

The object of the invention is to diminish the liability of burning or injuring the cutters by the rapid rotary movement of the emery-wheel in contact therewith. This is accomplished by arranging the emery-wheel so that its contact with the cutter will be only a hair-line, and by imparting to said wheel while in rotation a constant side motion over the work through the medium of a worm and wheel on the end of the driving-shaft, and an eccentric link that connects with the frame in which the emery-wheel is supported. The knife-carrying table is reciprocated beneath the emery-wheel by a steel cord that passes around a small drum on a shaft that is actuated by appropriate gearing from the main driving-shaft. The rapid reciprocation of this table still further diminishes the liability of burning the cutter. The table is driven in either direction by means of two gears acting alternately on the opposite faces of a double-faced driving-gear, suitable reversing-levers being provided; or the reversing can be accomplished automatically by means of adjustable tappets on the table. The jar is relieved by a spring, against which the tappets strike; and my invention consists in such peculiar arrangement and combination of parts for securing the cutter from the danger of burning or marring while being ground, as will be hereinafter specifically described, and set forth in the claims.

In the annexed drawings, illustrating the invention, Figure 1 is a side elevation of my improved grinding-machine. Fig. 2 is a top view of the same. Fig. 3 is a vertical cross-section on the line *x x* of Fig. 1. Fig. 4 is an enlarged cross-sectional view of the knife-holder and connections as shown in Fig. 3 on line *x x* of Fig. 1. Fig. 5 is a sectional detail illustrating the mechanism for imparting a laterally-reciprocating or sidewise movement to the grinding-wheel. Fig. 6 is a section on the line *y y* of Fig. 5.

Like letters of reference are used to designate like parts throughout the several views.

The frame A of the machine is preferably in the form of a pedestal, and supports a reciprocating table, B, that carries the knife or cutter holding devices. This table is actuated by means of a steel band or wire rope, *a*, connected to each end of the table, and passed centrally around a small drum, *b*, that is located in the upper part of the pedestal. Tension devices, consisting of a set-screw, *c*, or a pawl and ratchet-wheel, *d*, either or both, at opposite ends of the table, as shown in Fig. 1, are provided for regulating or adjusting the tension of the driving band or rope *a*. At one end of the shaft *e*, that carries the drum *b*, is a large double-faced friction-gear, C, which is alternately rotated in opposite directions by means of the small friction-gears *f g*, that are journaled in a bracket, D, which is carried by a rock-shaft, E, projecting from the side of the machine, as shown in Figs. 2 and 3. The friction gears or pulleys *f g* are driven by belting from the main driving-shaft F, as shown by dotted lines in Fig. 1.

On the opposite end of the rock-shaft E is a reversing-lever, G, by which the rock-shaft can be turned, so as to cause either the gear *f* or the gear *g* to bear against the large gear C. As one of these gears *f g* is arranged to bear against the periphery of the large friction-gear C, and the other is capable of bearing against its inner circumference, it will be seen that by shifting the lever G the gear C and drum *b* can be rotated in either direction at will.

In order to provide for an automatic reciprocation of the table B, a pair of adjustable tappets, *h h*, are detachably secured to one of its sides, so as to come alternately in contact with the lever G, thereby shifting the same and producing, through the rock-shaft E, drum *b*, and their connections, a rapid automatic reciprocation of the table. A spring, *i*, is at-

tached to the lever G, against which the tappets strike, thereby avoiding jar.

A counterbalance-lever, H, carrying a shiftable weight, I, is fulcrumed at *j*, and is provided with a short arm, *k*, having a beveled or wedge-shaped point or surface that is capable of engaging a similar surface at the lower end of the lever G, as shown in Fig. 1, thus holding the gear *f* or the gear *g*, as may be, in contact with the large friction-gear C; or the gears *f* and *g* may both be held away from the large gear by causing the pointed surfaces of the lever G and arm *k* to contact at their extreme ends. That this can be done will be readily apparent from a glance at Fig. 1, for it will be seen that these pointed surfaces may be brought into contact by a slight displacement of lever G and arm *k* from the positions therein shown, and such contact will be maintained by means of the yielding pressure of the belting encircling the pulleys *f* and *g* and shaft F. It will be thus seen that the table B is not only capable of a rapid automatically-reciprocating motion, but that its movement can be reversed or stopped at will without interfering with the action of other parts of the machine.

The surface of the reciprocating table B is hollowed or recessed, as shown in Fig. 3, for reception of an adjustable knife or cutter holding device, J, of any suitable construction. This knife-holder J is pivoted or centered at *m*, Figs. 1, 3, and 4, in standards *n n*, carried by the table, and is provided with adjusting screws or devices *p p*, by which it can be arranged at any desired angle, according to the bevel to be given to the planer knife or cutter. The holder J also carries two or more spring gages or guides, K, the construction of which is shown in Fig. 4. It will be seen that by these gages the cutter-bar or planer-knife *z* can be quickly and accurately placed in position for grinding. After the bar, cutter, or knife has been secured to the holder J by means of set-screws *s s*, passed through the usual slots in said bar or cutter, the gages K K will be turned aside, so as not to interfere with the action of the grinding-wheel.

The frame A supports at one end standards L L, that afford bearings for the main driving-shaft F, which carries pulleys M, and a driving-wheel, N, for actuating the grinding-wheel O, the latter being carried by a spindle or head-stock, P, that is journaled in a movable frame, Q, which is mounted near one end on the main driving-shaft. At one end of the movable frame Q is a shiftable counterbalance-weight, R, for regulating the pressure of the emery-wheel O upon the edge of the tool or surface being ground. The other end of this movable frame Q is vertically adjustable by means of a screw, *t*, passing through the extremity of said frame and loosely supported at its lower end in a standard, S, which is connected to the main frame of the machine, as shown in Fig. 1. The frame Q is provided with a slot or gap, *u*, Fig. 2, in which the driving-wheel N rotates, and it also has a cap or hood, T, for covering the grinding-wheel O and its head-stock or spindle P, as shown in Fig. 3.

It will be observed that the frame Q and the parts carried thereon have a slight lateral movement or reciprocation by means of a small worm, *v*, and eccentric wheel *w*, at one end of the driving-shaft F, the eccentric wheel *w* being connected by means of links *r r* to some fixed portion of the machine-frame. A slight lateral reciprocation is thus imparted to the emery grinding-wheel O while being rotated over the surface of the work, and this movement of the grinding-wheel, in connection with its yielding pressure on the work and the rapid reciprocations of the knife-carrying table, reduces the chance of injuring the cutter-blades to a minimum, and at the same time results in producing a uniform cutting surface or edge.

By reference to Fig. 3 it will be seen that the head-stock or spindle P, that carries the grinding-wheel, is provided with conical journals that have corresponding bearings in the lubricating-chambers U U, and with provisions for adjusting the parts and compensating for wear as may be required.

The operation and advantages of the machine will be readily understood from the foregoing description, and need not be further explained.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a machine for grinding cutters or knives, the combination of the table B, having adjustable knife-holder J and tappets *h h*, the drum *b*, cord or band *a*, shaft *e*, friction-gears C, *f*, and *g*, rock-shaft E, having a bracket for supporting the small gears *f g*, the reversing-lever G, having a spring, *i*, the counterbalance-lever H, and means, substantially as described, for actuating the gears, whereby a rapid automatically-reciprocating movement is imparted to the table, substantially as shown and set forth.

2. In a machine for grinding cutters or knives, the combination, with the main driving-shaft F and the grinding-wheel O, mounted on a spindle or shaft, P, that is actuated from said driving-shaft, of the movable frame Q, mounted on the main shaft and having a counterbalance-weight, R, adjusting-screw *t*, and a hood, T, substantially as described.

3. In a machine for grinding cutters or knives, the combination of the main frame A, having standards L L, the main driving-shaft F, the movable frame Q, carrying the grinding-wheel O, and means, substantially as described, for imparting a constant lateral movement to said grinding-wheel during its rotation, substantially as described.

4. In a machine for grinding cutters or knives, the combination of the main frame A, movable frame Q, grinding-wheel O, mounted in said movable frame, driving-shaft F, worm *v*, and eccentric wheel *w*, connected to the end

of said shaft, and the links *r r*, whereby a lateral reciprocation is imparted to the frame Q and its accompaniments, substantially as described.

5. In a machine for grinding cutters or knives, the combination of the main frame A, reciprocating table B, knife-holder J, mounted adjustably on said table, main driving-shaft F, having pulleys M N and worm-gear *v w*, the movable frame Q, and the grinding-wheel O, mounted in said movable frame, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE RICHARDS.

Witnesses:
ARTHUR C. HALL,
ALBERT E. HALL,
9 *Mount Street, Manchester.*