2 Sheets--Sheet 1.

W. KRUTZSCH.

Milling-Machine.

No. 166,704. Patented Aug. 17, 1875.

Fig. 1.

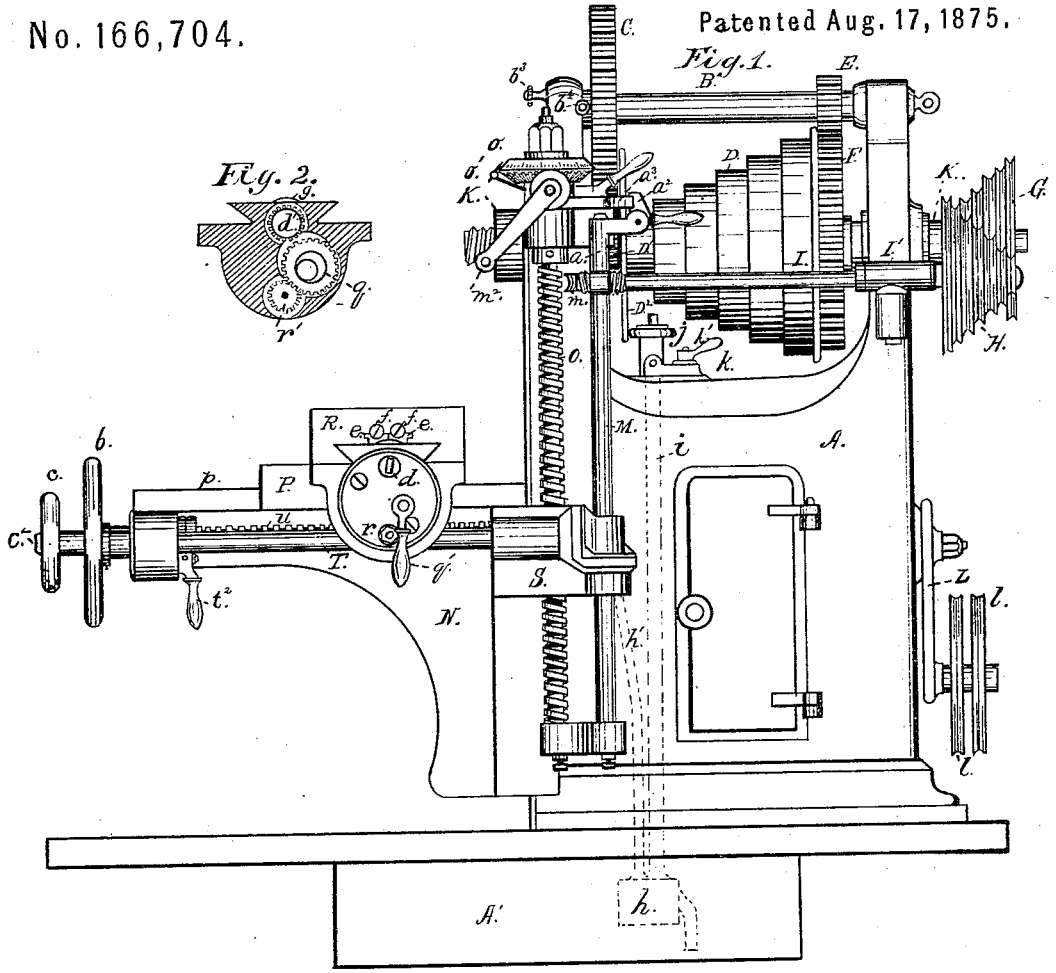
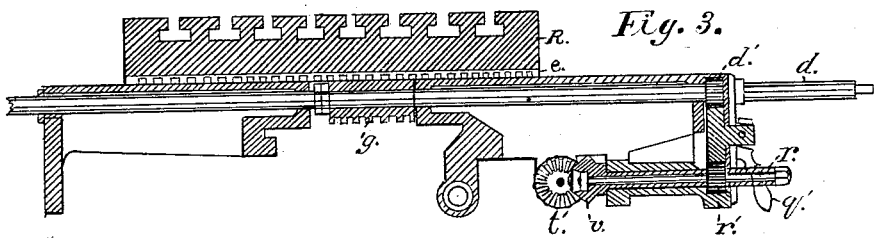


Fig. 2.

Fig. 3.



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2 Sheets--Sheet 2.

W. KRUTZSCH.

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Fig. 4.

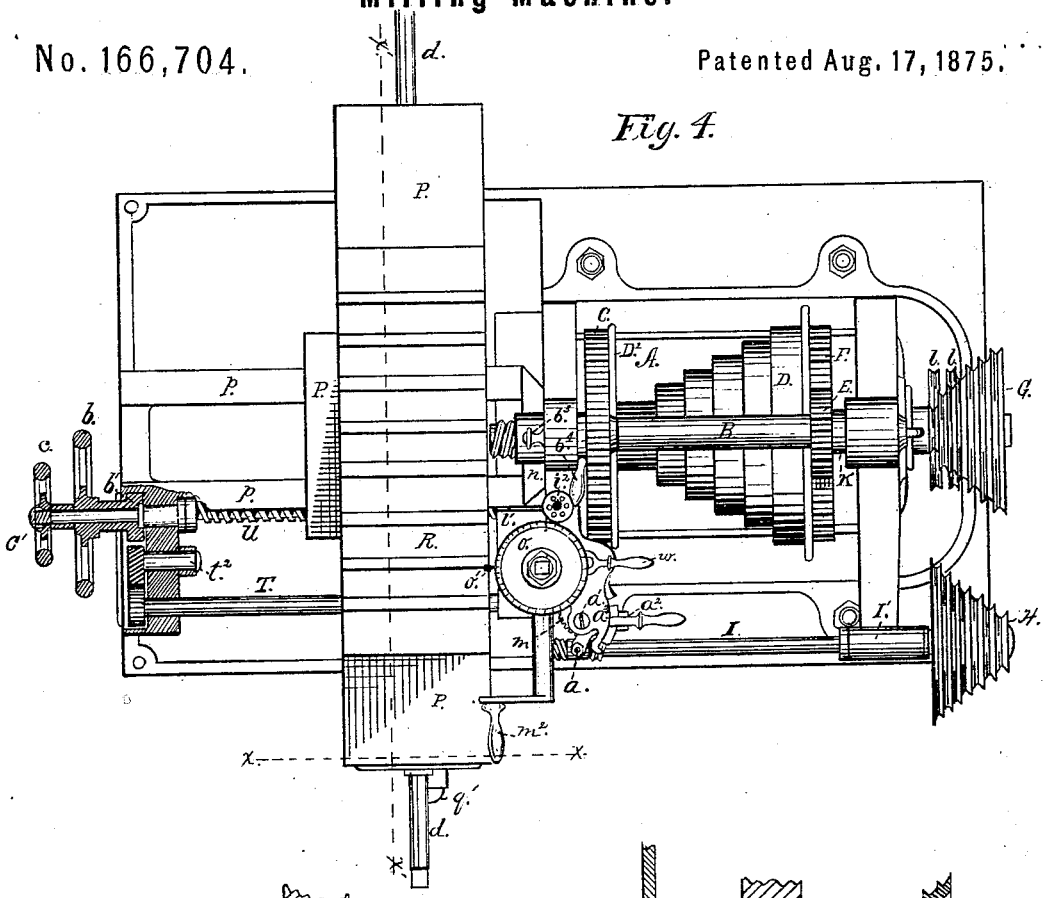


Fig. 5.

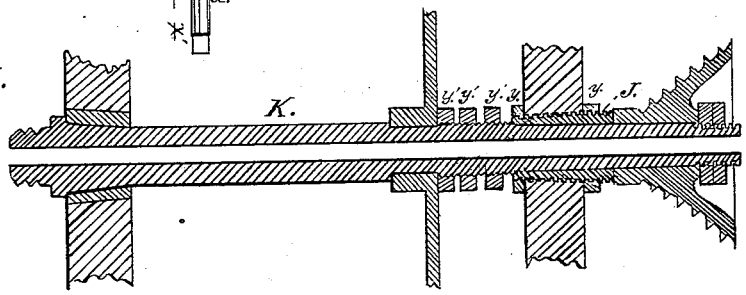
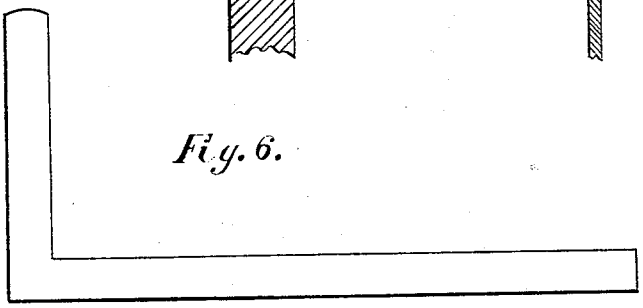
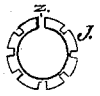


Fig. 6.





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UNITED STATES PATENT OFFICE.

WILLIAM KRUTZSCH, OF DAYTON, OHIO, ASSIGNOR TO GEO. W. HOGLEN AND CHARLES E. PEASE, OF SAME PLACE.

IMPROVEMENT IN MILLING-MACHINES.

Specification forming part of Letters Patent No. **166,704**, dated August 17, 1875; application filed April 15, 1875.

To all whom it may concern:

Be it known that I, WILLIAM KRUTZSCH, a resident of Dayton, in the county of Montgomery and State of Ohio, have invented new and useful Improvements in Milling-Machines, of which the following is a specification:

The nature of this invention consists in the combination and arrangement of certain mechanism in such a manner that the tables for supporting the work to be milled can be separately or collectively shifted by the machine itself, or by hand, from any one of three standpoints; also, in the particular arrangement of the mill-spindle, as will be hereafter explained; also, in the general construction of the machine, which will be fully described, and the invention distinctly pointed out in the claims.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I would thus describe it, referring to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved machine. Fig. 2 is a sectional view taken through the line $x\,x$ of Fig. 4. Fig. 3 is a sectional view taken through the line $x'\,x'$ of Fig. 4. Fig. 4 is a top view of my improved machine, with a portion broken away to show the arrangement of some of the parts. Fig. 5 is a longitudinal sectional view of the mill-spindle. Fig. 6 is a plan view of the brace for supporting work to be milled.

A represents the main frame, with which all the fixed bearings and brackets are cast, and also a water-tank, A′, upon the bottom of the frame. The spindle-head supports an ordinary spindle, K, on which a cone driving-pulley, D, disk D^2, and gear-wheel D^1 revolve. Motion is imparted to the spindle in an indirect manner from the wheel D^1, engaging with the larger gear-wheel C upon the shaft B parallel to and just over the spindle, which supports a small wheel, E, that engages with the large gear-wheel F, keyed upon the spindle at the rear of the driving-pulley. The shaft B is pivoted eccentrically in the spindle-head, and by withdrawing the pin b^3 and raising the handle b^4 the shaft is raised and the driving-pulley thrown out of gear. Upon the end of the spindle extending beyond the frame is a cone, G, and upon a movable arm, L, pivoted to the rear of the frame under the spindle, are two loose pulleys, $l\,l$.

I represents a shaft parallel to the spindle, and supported at the side of the frame in a pivoted bearing, I′. At the forward end of this shaft are a right and left worm, one on each side of the supporting-link a, eccentrically pivoted at a^1, and provided with a latch, a^2, moving upon an arc, a^3, provided with detaining-slots, by which the shaft I may be held at the desired position. This shaft is keyed to, but free to slide in, a hollow guide in the pivoted bearing I, to which guide the cone H, in a line with the cone G, but in an opposite direction, is attached.

The shaft I receives motion from the mill-spindle through the cones G and H, and imparts it to the upright shaft M, provided with the worm-wheel m, engaging with either the right or left worm upon the end of the shaft I.

N is a vertically-moving frame, working upon and supported by a guide, n, upon the front face of the main frame. This frame N supports the slides P and R, and is moved by the upright screw-shaft O, working in the bearing-block S, which extends laterally from the frame N. This screw-shaft is provided with an index-wheel, o, graduated to any scale, and having a stationary pointer, o', so that by means of the bevel-gearing and crank m^2, the tables may be raised or lowered to any extent ascertainable from the index.

The shaft M also passes through the bearing S, and imparts motion to the horizontal shaft T by means of the bevel-gear wheels within the bearing—one stationary upon the shaft T, and the other sliding upon the upright shaft M, to which it is keyed.

The table P, carrying the T-slotted table R, slides to and from the face of the main frame upon the guides p, and receives motion from the screw U, parallel to the shaft T, and provided with the tight and loose hand-wheels c and b. The table R, Figs. 1 and 3, upon which the work to be milled or gear-cutting machinery is secured, receives motion at right angles to that of the table P from the shaft d, provided with a screw, g, engaging with the rails e.

Here is an essential feature of my invention: The part of a nut in which the screw *g* works is divided longitudinally into the rails *e*, secured in the slide R, and held in position by the set-screws *f* at each end of the slide, so that in case of wear from the action of the parts, either or both of the rails may be shifted longitudinally, and backlash always be taken up.

A rotary pump, *h*, in the water-tank A′ is driven by the shaft *i*, provided with a friction-roller, *j*, which is actuated by the disk D^2 upon the driving-pulley, and which slides in a bearing, *k*, and can be thrown in or out of connection with the disk by mechanism K′. A pipe, *h′*, conveys the water to the nozzle i^1, Fig. 4, and its flow is directed upon the work or back into the tank by means of a two-way valve operated at i^2.

Another essential feature of my invention is the manner of connecting the mechanism for shifting the tables. It can be readily understood by reference to Figs. 2, 3, and 4. Suppose it is desirable to move the slide R automatically. The machine is started, and either the right or left worm upon the shaft I thrown into gear with the worm-wheel *m*, imparting motion to the shafts M and T, which are connected as described. The shaft T carries a sliding bevel-gear wheel, t^1, Fig. 3, keyed upon it, and constantly engaging with the wheel V, thus setting the short shaft *r* in motion. This shaft is parallel to and directly under the actuating-shaft *d*, and motion can be imparted from the former to the latter, Fig. 2, by means of the eccentrically-pivoted spur-wheel *q* engaging with the pinions *d′* and *r′*. A latch-handle, *q′*, Figs. 1 and 3, effects the connection, and enables the operator to throw the parts into and out of gear at will. A similar connection between the shafts T and U can be effected by tightening the nut *c′*, Fig. 1, upon the end of the screw-shaft U, thus jamming the loose wheel *b*, which is provided with a pinion, b^1, and can be set in motion by the shaft T and the connecting spur-wheel and latch t^2, arranged exactly as represented in Fig. 4. In the same manner connection can be made between the upright screw-shaft O and the shaft M by means of the latch-handle *w*, Fig. 4, throwing in and out of gear an eccentrically-pivoted spur-wheel, as before described. Thus it will be seen that any or all of the tables can be shifted by hand from the wheels *b* or *c*, or from a crank upon the shaft *d*, or from the crank m^2, or by the machine itself upon throwing the worms on the shaft I into gear.

Fig. 5 shows a central longitudinal section of the spindle, hollow throughout to receive the bar which supports the cutter. Its front bearing is constructed tapering, in the usual manner; but for a rear bearing I provide a tapering collar, J, fitted in a corresponding opening in the head, and with a thread upon its outside. This collar is slotted longitudinally nearly through from the outside, and at *z* entirely through, so that by screwing the nuts *y y* upon each end the collar may be made to fit tight or loose upon the spindle. Between its rear bearing and the driving-pulley the spindle is provided with the jam-nuts *y′*, by which its running may be regulated.

The brace, Fig. 6, may be attached to brackets on the side of the main frame, and in a line with the spindle, to aid in supporting heavy work, or as an extra bearing for the forward end of the milling-tool.

Having fully described my invention, I claim and desire to secure by Letters Patent—

1. The elastic collar J, slotted longitudinally upon its outer surface, and separated longitudinally, as described, in combination with the nuts *y* and spindle K, substantially as set forth.

2. The shaft I, keyed, but arranged to slide in the shaft revolving in the pivoted bearing I′, and provided with the right and left worms, for imparting motion to the upright shaft M, substantially as described, and for the purpose specified.

3. The eccentrically-pivoted link *a*, provided with the latch a^2, in combination with the arc a^3, and the right and left worms upon the pivoted shaft I, substantially as set forth.

4. The combination and arrangement of the parallel shafts O and M, T and U, *d* and *r*, each pair connected by the eccentrically-pivoted spur-wheels *q*, arranged as described, and also by the sliding bevel-gearing t^1 and *v*, whereby the operator is enabled to set any or all of the slides in motion from any one or all of the three stand-points mentioned.

5. The part of a nut divided into rails *e*, adjustable by the set-screws *f*, in combination with the screw *g* and slide *r*, substantially as set forth.

6. The combination and arrangement of the water-tank A, rotary pump *h*, shaft *i*, friction-roller *j*, disk D^2, and pipe *h′*, provided with a two-way valve, for returning the water to the tank without interfering with the action of the pump, substantially as set forth.

Witness my hand this 2d day of April, A. D. 1875.

WILLIAM KRUTZSCH.

Witnesses:

J. P. WHITMORE,

CHAS. M. PECK.