J. WATSON.

Milling Machine.

No. 98,821. Patented Jan. 11, 1870.

Fig. 4.

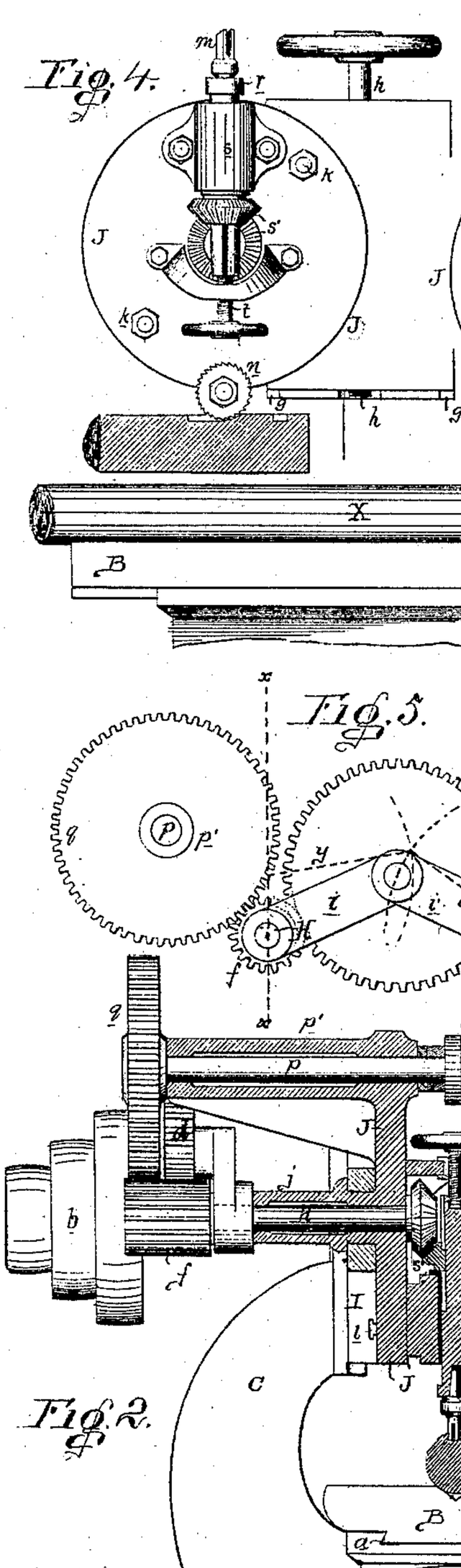


Fig. 1.

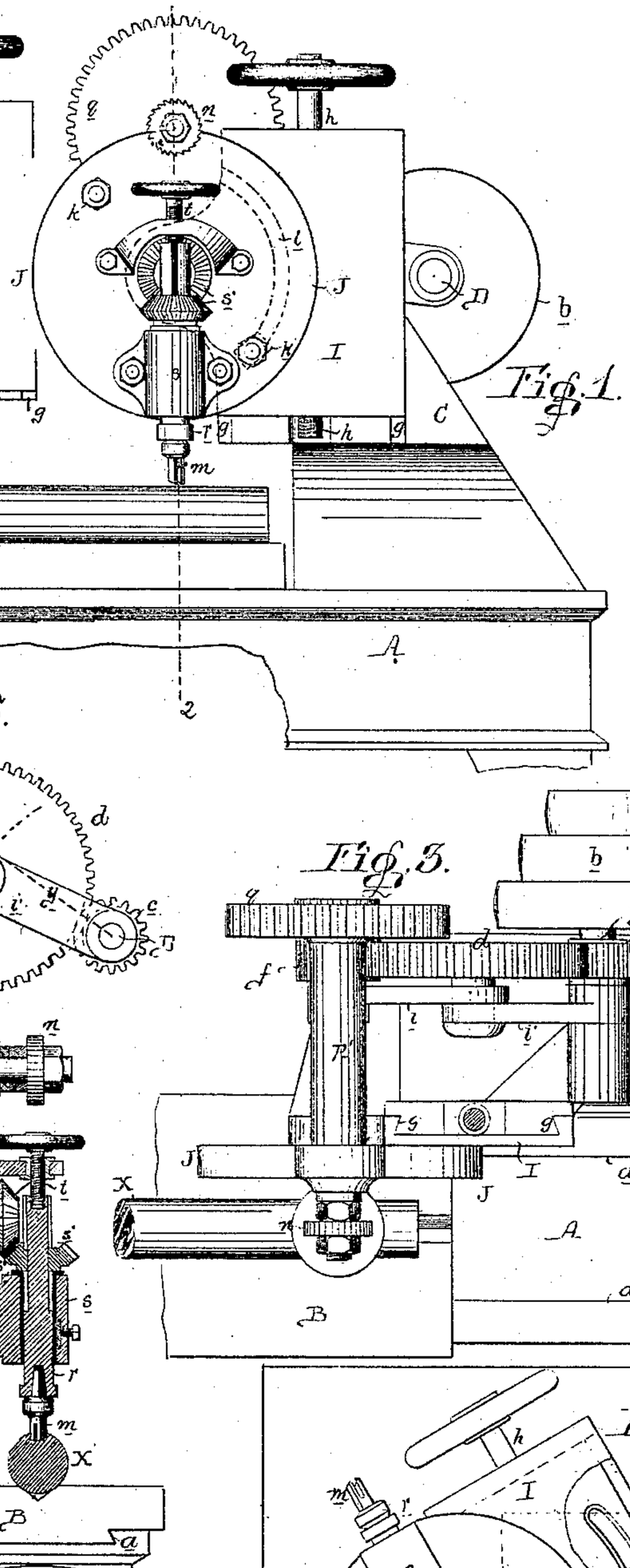


Fig. 5.

Fig. 3.

Fig. 2.

Fig. 7.

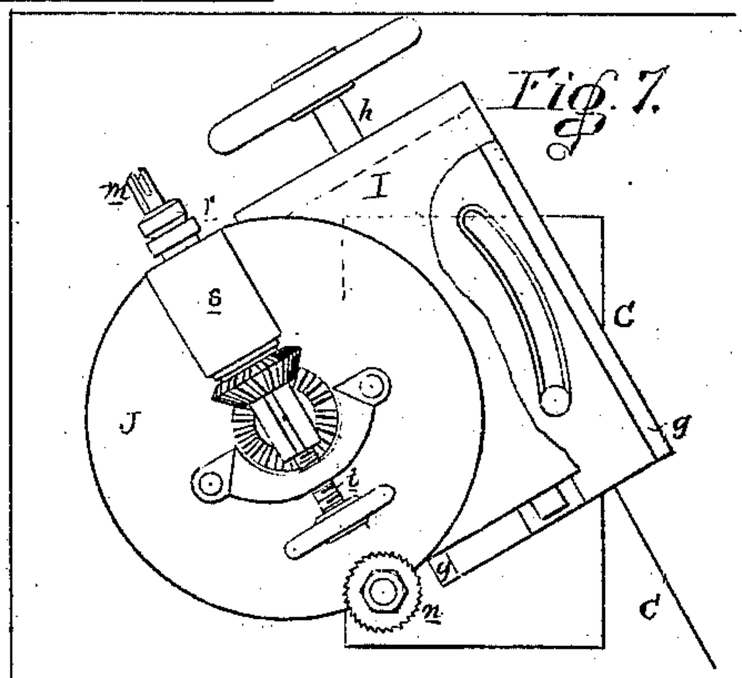
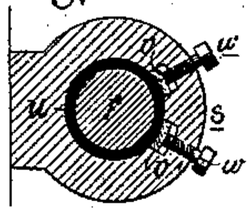


Fig. 6.



Witnesses { Wm. A. Stut.
Jno. B. Harding.

James Watson
by his Attys
J. T. Howson.

United States Patent Office.

JAMES WATSON, OF PHILADELPHIA, PENNSYLVANIA.

Letters Patent No. 98,821, *dated January* 11, 1870.

IMPROVED MILLING-MACHINE.

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

To all whom it may concern:

Be it known that I, JAMES WATSON, of Philadelphia, State of Pennsylvania, have invented an Improved Milling-Machine; and I do hereby declare the following to be a full, clear, and exact description of the same.

My invention consists of a milling-machine, fully described hereafter, which, although adapted to a great variety of work, is especially intended for cutting the key-seats and feather-ways of shafts; a principal advantage of the machine being that it performs its duty completely and effectually, without requiring a tedious readjustment or transferring of the work from one machine to another, as heretofore.

In order to enable others, familiar with machinery of this class, to make and use my invention, I will now proceed to describe its construction and operation, reference being had to the accompanying drawing, which forms a part of this specification, and in which—

Figure 1 is a front view of my improved milling-machine;

Figure 2, a transverse sectional view of the same, on the line 1–2, fig. 1;

Figure 3, a plan view;

Figures 4, 5, and 6, detached views of portions of the machine; and

Figure 7, a view of a modification.

Similar letters refer to similar parts throughout the several views.

A represents the bed-plate of the machine, upon which are formed guides, *a a*, for the sliding plate B, to which the work is secured; and at one end of the said bed-plate is a pedestal or bracket, C, in suitable bearings on which, turns the driving-shaft D, furnished with a cone-pulley, *b*, and with a toothed pinion, *c*, the latter, through the medium of a cog-wheel, *d*, communicating motion to a pinion, *f*, of a spindle, H, which turns in suitable bearings on a movable head, I.

The latter is arranged to slide vertically upon guides *g g*, formed upon the bracket C, and is adjusted to any required position by means of a screw, *h*, operating in a manner which will be readily understood by those familiar with machinery of this class.

The driving-shaft D being stationary, and the spindle H capable of a vertical adjustment, it is necessary that the cog-wheel *d* should be so arranged as to always remain in gear with the pinions *c* and *f*.

This is effected by means of two arms, *i* and *i'*, (fig. 5,) hung to the shaft D and spindle H, and the outer ends of which are connected together by, and serve to support the spindle of the cog-wheel *d*.

When the spindle H is raised or lowered upon the vertical line *x x*, the arms *i* and *i'* will adjust themselves accordingly, (see dotted lines *y y*,) in such a manner as to retain their cog-wheel in gear with the pinions *c* and *f*.

The spindle H turns in a sleeve, *j*, (fig. 2,) which is itself arranged to turn in a bearing of the head I, and to the front end of which is secured a flat disk, J, the latter being in contact with the front of the head I, and having T-headed bolts, R R, adapted to a curved slot, *l*, of the said head, for the purpose of securing the disk in any position to which it may be adjusted.

The adjustable disk J is furnished with a drill, *m*, and at a point directly opposite to this drill, with a rotary cutter, *n*, the spindle *p*, of the latter, turning in a tubular projection, *p'*, of the disk, and having, at its rear end, a cog-wheel, *q*, gearing into the pinion *f*, the cog-wheel revolving around this pinion when the disk is adjusted, but always remaining in gear with the same. (See figs. 2 and 5.)

The spindle *i'*, of the drill *m*, turns in a tubular projection or bracket, *s*, of the disk J, receives its motion from the spindle H through the bevel-gear *s'*, and is adjusted toward or from the work by a screw, *t*, in the usual manner.

The anti-friction-metal box *u*, (figs. 2 and 6,) which is set into the bearings *s*, for the reception of the drill-spindle, is tightened against the latter, as it wears, by means of blocks, *v v*, against which bear the ends of set-screws *w w*, this plan enabling the box to be used for a much longer time than usual, without permitting the spindle to work loose.

It has been usual, heretofore, in cutting the key-seats and feather-ways of shafts, to employ both a drill and a circular milling-tool, similar to those shown in the drawing, the groove being first cut by the milling-tool, after which the shaft is removed to a different machine, in order to square up the ends of the said groove by means of a drill. This removing of the shaft from one machine to another, and the time required in its readjustment, render the work, especially for heavy shafting, both tedious and expensive, so much so, that when the key-seat or feather-way is of but moderate length, it is found preferable to perform the whole operation by means of the drill alone.

The object of my present invention is, by combining the drill and milling-tool in one machine, to render the shifting or readjustment of the work unnecessary.

Its operation is as follows:

The shaft X, in which the key-seat is to be cut, is properly secured upon the adjustable plate B, the disk J being then turned to the position shown in fig. 1, and secured to the head I, by means of the bolt *k*. Motion is then communicated to the driving-shaft, and transmitted, through the gearing described, to the drill *m*, the latter being then lowered, by means of its screw *t*, until a hole of the depth of the key-seat has

been cut in the shaft. The plate B, and shaft, are next so adjusted, that at the second descent of the drill, a hole shall be cut at a point coinciding with the opposite end of the key-seat.

After this the bolts *k* are loosened, and the disk J is, without stopping the motion of the machine, turned half way around, or to the position shown in fig. 4, the disk being then secured as before, and depressed by a proper operation of the screw *h*, until the milling-tool *n* cuts into the shaft to the proper depth of the key-seat.

All that now remains to be done is to move the plate B, and shaft, longitudinally until the cutting of the groove is complete, the drill-holes first made forming the ends of the same, as clearly shown in fig. 4.

The above machine, although intended especially for cutting key-seats and feather-ways, is, it will be evident, adapted for the performance of a great variety of work, and in order to increase its usefulness, a portion of the bracket C may, if desired, be made adjustable, as shown in fig. 7, so as to enable the cutting to be performed at any angle.

I am aware that a revolving disk, carrying a series of radial drills, any one of which may be employed by adjusting the disk, has been used; but it will be seen that in the above-described improvement, the arrangement on the disk of both radial and transverse shafts, revolving at different rates of speed, permits the successive use of tools very different in character and operation, so that operations can be performed in one machine, and without removing the article operated on, that could otherwise be effected only with two distinct and very different machines, and by the transfer of the article from one to the other. Without claiming, broadly, a revolving disk, carrying two or more revolving cutters or tools,

I claim as my invention, and desire to secure by Letters Patent—

1. The revolving disk J, in combination with a radial shaft, *r*, carrying a drill, *m*, a transverse shaft, *p*, carrying a milling-tool, *n*, and with the shaft H, cog-wheels *d*, *f*, and *q*, and bevel-gear *s'*, or equivalent devices for operating the shafts, substantially as described.

2. The combination of the revolving disk J, its shafts *p* and H, and cog *q*, with the arms *i i'*, driving-pinion *c*, wheel *d*, and pinion *f*, as specified.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JAMES WATSON.

Witnesses:
E. H BAILEY,
HARRY SMITH.