(No Model.)

W. F. DRAPER.

SPINDLE.

No. 245,286. Patented Aug. 9, 1881.

Fig. 1

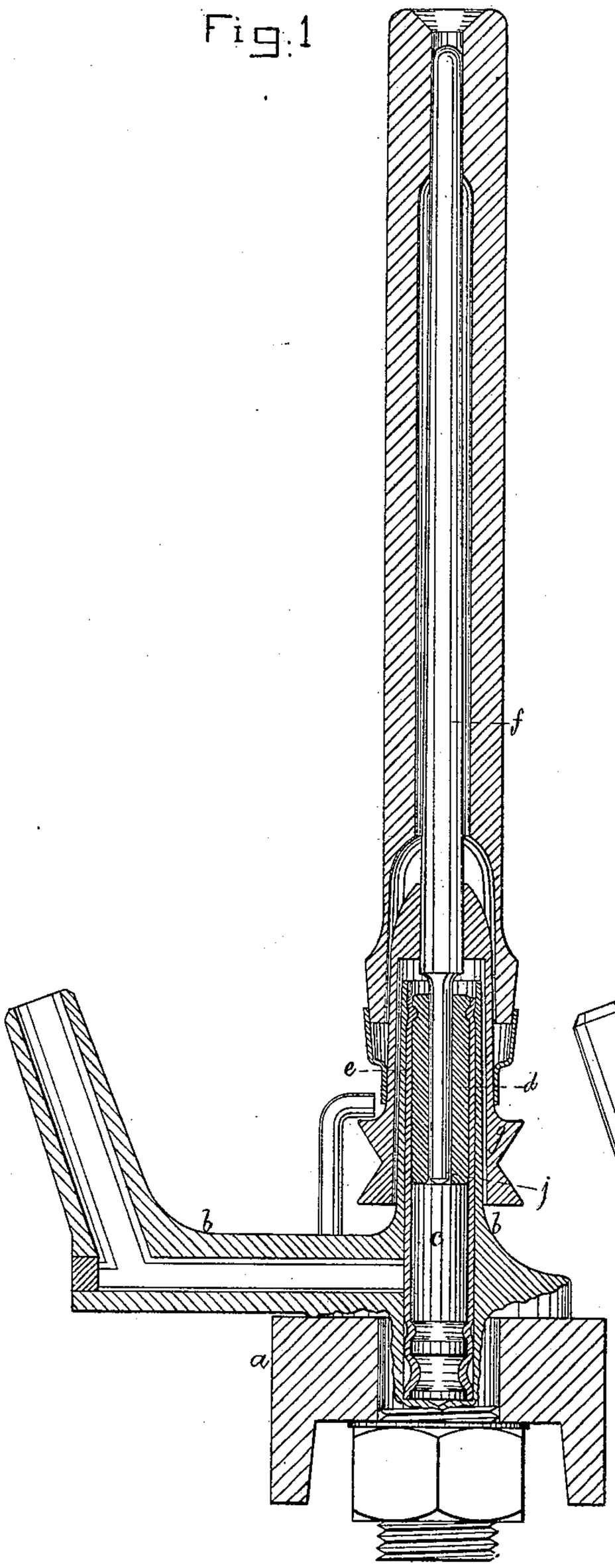
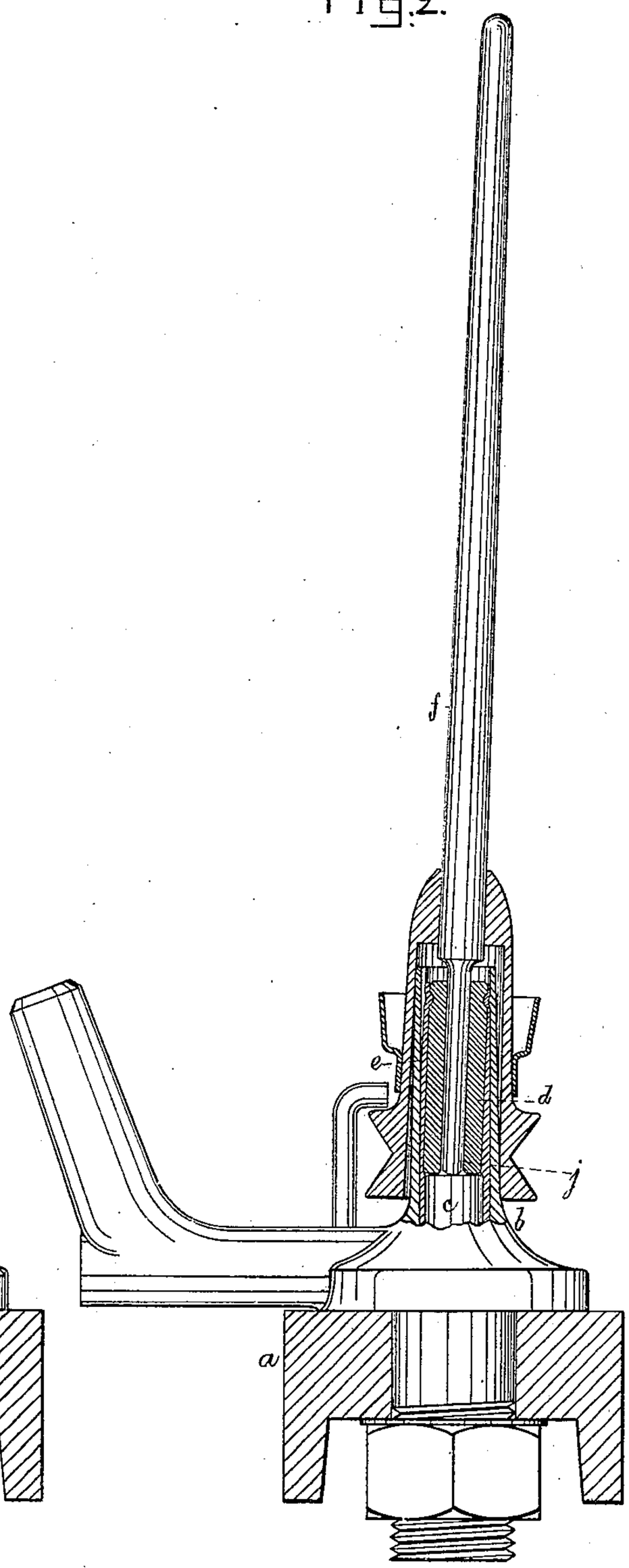


Fig. 2.



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UNITED STATES PATENT OFFICE.

WILLIAM F. DRAPER, OF HOPEDALE, MASSACHUSETTS.

SPINDLE.

SPECIFICATION forming part of Letters Patent No. 245,286, dated August 9, 1881.

Application filed April 21, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. DRAPER, of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Spindles, of which the following description, in connection with the accompanying drawings, is a specification.

This my invention in spindles for ring-spinning machines is represented as embodied in that class of spindles having a sleeved whirl, and wherein the lower end of the spindle is surrounded by a bolster which may yield laterally, thus permitting the spindle and bobbin, and yarn laid thereon, to find and revolve about their natural center of rotation, thus obviating gyration and wear, and enabling the spindle to run at high speed.

In spindles of this class heretofore in use the lower end of the spindle has always been extended below the lower end of the whirl, and the spindle has generally been extended as far below the center of the whirl as the yielding bolster extends above the center of the whirl, so as to bring the band-pull substantially at the center of the yielding bolster, thus necessitating a considerable length of spindle between the top and bottom of the bearing or bearings for the spindle. To enable this bearing portion or pintle of the spindle to withstand the strain of doffing and other extraordinary strains in excess of that which would be produced by the band when driving a spindle, or that arising from an ordinary unbalanced load on the said spindle, it has been found necessary to make this bearing portion of the spindle of much greater diameter than would be required if the spindle were subjected only to the strains of running. Any increase in diameter of bearing proportionately increases the amount of power required to drive the spindle, and vice versa, which is a matter of the greatest importance, for the power required to run the spindles is estimated by the best authorities to be about one-third of that required to run all the machinery in a cotton-mill.

I have discovered by a system of experiments that if the bearing or pintle portion of the spindle is shortened, so as to terminate substantially opposite the pull of the band of the whirl, the said portion of the spindle may be made much smaller in diameter, thereby saving proportionately in power required to turn the spindle, and at the same time the spindle operates better in other respects. The change of the whirl from the center of the bolster and from a distance from the bottom of the spindle to the bottom practically of both spindle and bolster reduces to the minimum that effect of the band-pull which tends to prevent the spindle from assuming its natural center.

It is evident that with the band-pull above the bottom of the spindle any attempt of the spindle to center itself under an unbalanced load has to encounter the resistance of the strain of the band, while by bringing the whirl opposite the foot of the spindle slight variations in the position of the spindle do not lengthen or shorten the band to any appreciable extent.

A boy can spin a top much more successfully by winding his string on a pulley near the bottom than near the upper end thereof, and the nearer to the bottom the better. Both by reasoning and experiment I am satisfied that this principle holds true with spindles of this class, and that besides the saving of power, as heretofore explained, the steadiness of rotation of the spindle will be increased by the changes I have indicated.

To enable me to employ a spindle with its bearing portion so shortened I have shortened the bolster and elevated that bearing which sustains the weight of the spindle, usually called the "step," to a position substantially in the line of the band-pull, which, it is obvious, may readily be done whether the bolster and step are made as separate pieces, as in the Rabbeth patent, No. 227,129, or in the Birkenhead patent, No. 234,522, though the former is deemed the much best plan in practice.

In my experiments I have also found that the stiff sleeve part of the spindle may be made to receive and resist the extraordinary strain above referred to, so that the bearing portion of the spindle cannot be permanently bent in doffing. To accomplish this desired object I have made and supported the bearing for the spindle in the bolster-supporting tube, so that sufficient space is allowed for the bolster to yield freely to all the running-strains, and the diameter of the opening in the whirl is of such

size as not to touch the said supporting-tube when the spindle is subjected to only running-strain; but on the occurrence of the extraordinary strains referred to the inside of the whirl or sleeve will come in contact with the said supporting-tube before the bearing portion of the spindle is subjected to such strain as would permanently bend it. By these changes I have been enabled to reduce the diameter of the bearing portion of the spindle nearly one-half beyond what is practiced in modern spindles of this class, thus making a very great saving in power.

Figure 1 represents, in partial vertical section, a sleeve-whirled spindle embodying my invention, the bobbin thereon being in section. Fig. 2 is a view thereof showing the sleeve part of the spindle as operative to receive the strain, which, were it not for the sleeve, would be received by the bearing portion of the spindle.

The fixed rail *a*, common to ring-spinning frames, has secured to it in the usual way the bolster-supporting tube *b*, having within it the spindle-supporting step *c*, on which the spindle rests and moves as it finds its true center, and also the yielding and movable bushing *d*. (Shown in the drawings as surrounded by an elastic or yielding medium or packing, *e*, placed between the bushing and the interior of the supporting-tube.)

As so far described, the said devices, irrespective of their relative positions and sizes, as hereinafter more fully explained, are all substantially as in spindles now known and in use—as, for instance, in United States Patent No. 227,129; but instead of the exact form of spindle-supporting step, bolster, and yielding bearing shown in the drawings, I may employ the form of step and yielding bearing shown and described in United States Patent No. 234,522; or, instead of the step and bolster devices referred to and shown, I may employ any other well-known form of yielding bearing and step now used in connection with spindles in spinning-frame bolsters and steps devised to permit the bearing portion of the spindle and its bolster-bearing, or its bolster and step bearing, to yield and enable the spindle to find its natural center of rotation and obviate gyration and wear of the spindle and enable it to be run at the high rate of speed at which modern improved spindles of the Sawyer and Rabbeth patents are now commonly run.

The spindle *f* has connected with it the usual sleeve-whirl, *g*, grooved to receive the driving-band of usual construction, which rotates the spindle in the usual manner.

In other spindles of this class heretofore made having yielding bushings, so far as I am aware, the bearing portion at the lower end of the spindle has been extended as far below the center of the whirl as the yielding bolster has been made to extend above the center of the whirl, so as to bring the band-pull substantially at the middle of the bushing, and the said bearing portion has been usually at least nine thirty-seconds of an inch in diameter, to offer sufficient strength or stiffness of spindle to prevent the spindle being permanently bent out of true when subjected to extraordinary strain, such as when doffing, or strains other than those to which the spindle is subjected when running and doing regular work.

The bearing or pintle portion *j* of my improved spindle is shortened, so that its lower end terminates substantially in the line of the band-pull, and the diameter of the said end portion is reduced to about one-eighth of an inch, thus greatly reducing the power required to drive the spindle. The step *c* is elevated, so that it also comes substantially in the line of the pull of the band.

To enable the stiff sleeve part of the spindle to receive and resist the extraordinary strains referred to, I have made the diameter of the opening within the sleeve-whirl of such size with relation to the external diameter of the supporting-tube that the interior of the sleeve-whirl will not touch the tube under any strain or pull of the band exerted or demanded in running the spindle for spinning; but on the occurrence of any extraordinary strain in excess of running-strain—as, for instance, when doffing—the interior of the whirl will strike the tube before the elastic or yielding bushing finishes its movement in the same direction within the tube, and thus I am enabled to obviate the application to the bearing portion of the spindle of as great strain as would be apt to permanently bend it.

Fig. 2 shows the spindle tipped over, as will usually be the case when doffing, and to avoid permanently bending the small or reduced bearing portion *j*, the interior of the sleeve-whirl is of such diameter as to strike the supporting-tube just before the spindle is subjected to such extraordinary strain as would be apt to bend it so far as to make the said bend permanent. The entire side strain of the band is not applied solely to a spot exactly opposite the bottom of the groove in the whirl, but is substantially at such. In spindles driven by a gear the bevel-gear on the spindle has been connected with the spindle near its lower end, as in United States Patent No. 43,153, to Gilman; but in all such cases the point of the spindle has been rigidly held in its step-bearing, and the spindle has also had a rigid bolster-bearing above the gear, so that there was no opportunity for the spindle to find and run in its natural center of rotation when unbalanced or carrying an unbalanced load.

The bolster-bearings will preferably in practice be slightly tapered externally, growing larger toward its bottom; or the packing may be made a little more dense immediately opposite the band-pull, so as to resist in proportion to the strain any tendency of the band to draw the spindle laterally toward one side of the supporting-tube. The bolster-bearing portion of the spindle should, in all cases, be made cylindrical.

The capacity of the sleeve and supporting-tube to protect the pintle *j* is due to the cir-

cumstance that the pintle is shortened, as described, whereby any deflection of the spindle from the vertical necessarily causes the sleeve and tube to bring up before any strain can come upon the pintle. If the pintle were longer this result could not be accomplished practically, it being a question of relative leverage.

I claim—

1. The sleeve-whirled spindle having the lower end of its bearing or pintle *j* terminated substantially opposite the pull of the spindle-driving band, combined with a yielding bolster and external support for it and a step to support the weight of the spindle, as set forth.

2. The sleeve-whirled spindle having the lower end of the bearing or pintle *j* located substantially opposite the pull of the band on the whirl, combined with a step, also located substantially in the same line to support the weight of the spindle, substantially as described.

3. The spindle reduced in size in its entire bearing portion, as specified, and its attached sleeve-whirl having an internal opening of sufficient diameter to turn about, but not come in contact with, the supporting-tube for the spindle during running, combined with the yielding bolster and spindle-supporting tube, of such diameters as to arrest the movement of the whirl, as described, when the spindle is subjected to extraordinary strain referred to in doffing, before the spindle is permanently bent, substantially as described.

4. A sleeve-whirl spindle the supporting-pintle of which terminates substantially in a plane coinciding with the plane of the band-groove of the whirl, combined with a yielding bearing for the pintle and a supporting-tube for the same, as hereinbefore described, whereby any strains incident to the undue deflection of the spindle from the vertical will be sustained by the supporting-tube and sleeve, instead of by the pintle, substantially as described.

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

WM. F. DRAPER.

Witnesses:

F. J. DUTCHER,

GEO. A. DRAPER.