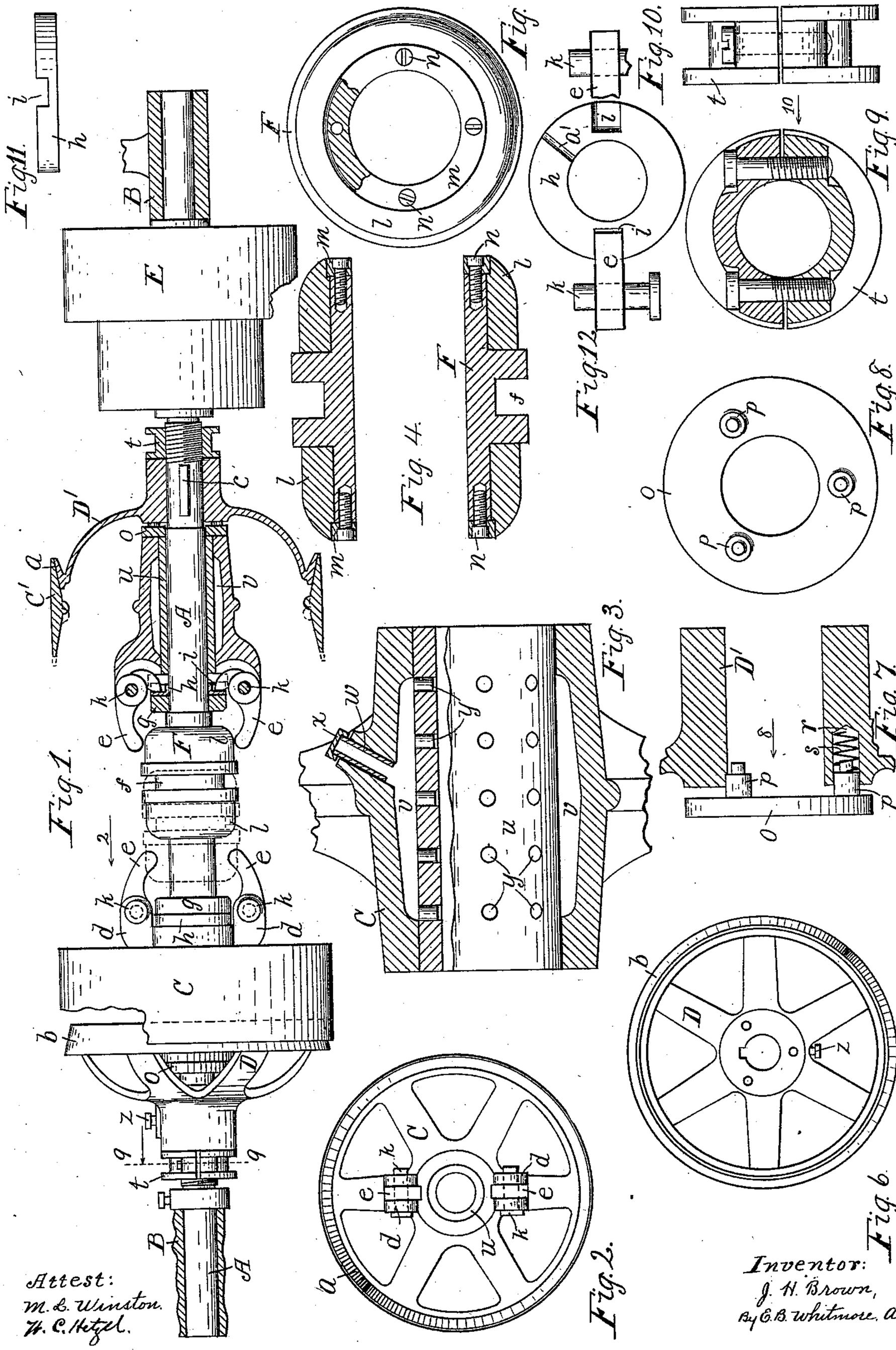
(No Model.)

J. H. BROWN.

COUNTER SHAFT.

No. 561,198. Patented June 2, 1896.



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COUNTER-SHAFT.

SPECIFICATION forming part of Letters Patent No. 561,198, dated June 2, 1896.

Application filed August 24, 1895. Serial No. 560,396. (No model.)

To all whom it may concern:

Be it known that I, JESSE H. BROWN, of Syracuse, in the county of Onondaga and State of New York, have invented a new and useful Improvement in Counter-Shafts, which improvement is fully set forth in the following specification and shown in the accompanying drawings.

This invention relates to counter-shafts, usually hung overhead, employed with screw-threading machines, lathes, and other machines in which there is both a forward and a reverse motion of the spindle necessary for doing the work, which counter-shaft carries pulleys, one holding an open belt and the other a cross-belt, leading from the line-shaft. Friction-surfaces are employed for turning the counter-shaft; and the invention consists principally in providing against wear of the parts most exposed to abrasion, which as to certain of the surfaces in contact, if considerable, would tend to derange the friction action.

The object of the invention is to provide a counter-shaft, with accompanying parts, which shall be of easy operation, noiseless, and quick in action, and also one that will admit of convenient and easy refitting of the parts when worn, so that the shaft will last longer and render greater service than those in common use.

The invention is hereinafter fully described and more particularly pointed out.

Referring to the drawings, Figure 1 is a side elevation of the counter-shaft with some of the parts sectioned on an axial plane. Fig. 2 is an end elevation of a driving-pulley, seen as indicated by arrow 2 in Fig. 1. Fig. 3 is an axial section of the hub of a driving-pulley, drawn to better show the construction of the parts. Fig. 4 is an axial section of the shifting head. Fig. 5 is an end view of the head with a part broken away. Fig. 6 is an end view of a spider, seen as indicated by arrow 2 in Fig. 1. Fig. 7 is an axial section of the hub of a spider and associated parts, drawn to better show their construction. Fig. 8 is a side view of a plunger-head, seen as indicated by arrow 8 in Fig. 7. Fig. 9 is a side elevation of an adjusting-collar, transversely sectioned as on the dotted line 9 9 in Fig. 1. Fig. 10 is a face view of an adjusting-collar, seen as indicated by arrow 10 in Fig. 9. Fig. 11 is an edge view of one of the fulcrum-rings used in shifting the pulleys. Fig. 12 is a face view of a fulcrum-ring with some associated parts. Figs. 2 to 12, inclusive, are drawn to various scales larger than that of Fig. 1.

Referring to the parts shown in the drawings, A is the counter-shaft proper, resting in bearings in suitable hangers B B.

E is an ordinary step-pulley connected by a belt with a corresponding pulley on the spindle of the machine below and secured to the counter-shaft by a set-screw or other simple means.

C C′ are belt-pulleys adapted to turn freely on the shaft, one carrying an open belt and the other a cross-belt, both leading from the line-shaft. These pulleys turn in opposite directions on the shaft, and either may be given control of the shaft when desired. These pulleys are formed with friction-surfaces *a*, preferably conical, as shown in Figs. 1 and 2.

D D′ are friction wheels or spiders having friction-surfaces *b b*, Figs. 1 and 6, held upon the shaft in positions to have their friction-surfaces engage the respective friction-surfaces of the pulleys C C′. The pulleys are adapted to move longitudinally upon the shaft through short distances, and the spiders are adapted to be adjusted longitudinally upon the shaft, but always to turn with the latter on account of a short spline within the hub of each, rigid in the shaft, one being shown at *c*, Fig. 1. When the pulley C, for instance, is thrown against its companion wheel D, the belt on said pulley turns the counter-shaft, the pulley C′ idling during the time, and when the pulley C′ is thrown against its companion D′ the belt on said pulley C′ turns the counter-shaft in the opposite direction and the pulley C idles.

The opposing ends of the hubs of the pulleys C C′ are formed with rigid bifurcated lugs *d d*, holding bent levers *e e*, Figs. 1, 2, and 12, projecting toward each other. A shifting head F, Figs. 1, 4, and 5, is provided on the shaft to coact with the levers *e*, which head may be splined on the shaft or adapted

to turn freely thereon, as may be desired. This shifting head is formed with a central groove *f* to receive the fork of an ordinary shifting-lever (not shown) common in this class of devices.

The shaft is provided with rigid collars *g g* against which loose fulcrum-rings *h h* bear, Figs. 1, 11, and 12, said rings being preferably of steel, the collars *g g* being of other material, as cast-iron. These fulcrum-rings, backed up against the rigid collars, serve to receive the thrust of the levers when in the act of shifting the pulleys, said rings being formed with recesses *i i*, in which to receive the short ends of the levers, as shown. These levers, carried by the pulleys, turn freely in their bearings in the hubs on pins *k*, and the action of the sliding head, when forced between the long arms of the levers at either side is to throw them apart and so force the pulley along the shaft against the adjacent friction-wheel to engage and turn it and the shaft. In these actions of the levers the points of contact between their short arms and the rings *h h* are the fulcrum-points, the respective pulleys being the loads connected with the levers by the pins *k k*. These levers, thus placed, constitute means for connecting the shifting head and the pulleys for the purpose of moving and controlling the latter.

The ends of the shifting head or cheeks in contact with the levers are rounded or tapered, so as to glide easily between the levers at either side when moved toward the right or the left by means of the shifting-lever.

The shifting head is not in one solid piece, but made up of combined parts, as shown in Figs. 4 and 5. The main part or body is provided with loose annular cheeks or parts *l*, which encounter the levers. These cheeks occupy seats at the ends of the main part and are held to place by concentric rings *m m*, secured to the main part by fasteners *n*. The parts are so constructed that the cheeks turn freely upon their bearings and so serve to prevent wear at the ends of the levers, where the latter bear upon the cheeks. This is important, for any considerable wear of the parts at those points would materially affect the friction-contacts and so make readjustments of the parts frequently necessary. In any instance when the head is carried against or brought in contact with the levers the motions of the latter and the cheek will instantly correspond and both turn together and so prevent wear between them, the friction and wear being transferred to the broader area of contact between the cheek and the main part of the head. On this account the wear between the head and the levers is reduced to a minimum, which enables the shaft to do long service without need of repairs or having the friction-surfaces readjusted.

To automatically force either pulley away from its companion wheel after the head has been shifted to release the levers, and thus destroy the friction-contact between them, I employ a plunger-head *o*, Figs. 1, 7, and 8. This head is provided with several (preferably three) longitudinal plungers *p*, adapted to enter corresponding cavities *r* in the hub of the wheel. Spiral springs *s* are inserted in the cavities and act in a manner to push the plungers outward and the plunger-head away from the hub of the wheel. These annular plunger-heads fit freely on seats upon the shaft A and bear at their back surfaces against the ends of the respective hubs of the belt-pulleys C C′, one being clearly shown in Fig. 1. The action of the springs is to throw the pulley back from the spider or wheel, as shown by the positions of the parts C D in Fig. 1, in which case the pulley turns independently of the friction-wheel. When the shifting head is thrown to one side or the other to press a pulley against the friction-wheel, the pulley moves toward said wheel against the action of the springs *s*.

Each friction wheel or spider is backed up or held to its work by a split adjusting-collar *t*, Figs. 1, 9, and 10, threaded on the shaft against the end of the hub of the spider. By means of these adjusting-collars the spiders may be at any time moved slightly toward or from the adjacent pulleys to compensate for wear and to regulate the friction-contacts between them.

In doing heavy work with the lathe or machine with which the counter-shaft is operating the whole power of the belts on the pulleys C C′ is frequently required, on account of which the friction-surfaces have to be brought together with much force by the hand of the operator upon the shifting-lever. In such cases the adjusting-collars *t t* are set up snugly against the hubs of the respective spiders so as to push the latter toward the companion belt-pulleys. Then by crowding the shifting head between the levers the pulleys will be pressed hard against the spiders, and the friction between those parts will be intensified. On the other hand, should the machine be doing light work, in which rapidity and quickness of action are essential matters, the adjusting-collars are turned back from the spiders to cause the shifting head to bear but lightly against the levers when thrown between them. This enables the operator to manipulate the shifting-lever quickly and with a light touch, as but very little effort is then required to throw the friction on and off.

To reduce the friction and wear between the hubs of the pulleys and the shaft, I provide each hub with a bushing-tube *u*, Figs. 1 and 3. Outside of the tube each hub is formed with an annular oil-cavity *v*, the oil being supplied through a tube or other opening *w* through the wall of the hub, tightly closed by a cap *x*. The bushing-tube is perforated adjacent to the oil-cavity, in which perforations are snugly inserted bodies *y*, of rattan or other porous material, through which by capillary attraction the oil is gradu-

ally supplied to the shaft. These bodies of rattan or porous material are not in contact with the shaft at their inner ends, but stand slightly apart therefrom, so as not to become glazed by the action of the shaft, which glazing would tend to unfit them for the transmission of the oil. The oil in the space *v* constitutes a reservoir from which the shaft may be supplied during a long period of time.

Observing the shaft A, Fig. 1, it will be seen that different parts of its length are made of different diameters—that is to say, the diameter is greatest at the middle, where occupied by the shifting head F, slightly smaller each way from the middle to form seats for the pulleys, smaller still toward the ends, where the friction-spiders are seated, and smallest of all in diameter at its ends, where it bears in hangers B B. Each succeeding part of the shaft, going from the middle toward the ends, is less in diameter than the preceding part, the shaft being preferably alike as to diameters both ways from the middle. This form not only gives great stiffness to the shaft, from being largest at the middle where the greatest stress is thrown upon it by the action of the belts, but it allows of conveniently placing thereon from either end the pulleys, spiders, and other parts it is intended to carry, such parts being duplicates on either side of the shifting head, except as to the step-pulley E. Furthermore, this form of shaft permits of its being trued up in a lathe and put into shape where occupied by the belt-pulleys and the shifting head, where most worn by the action of those parts, several times before being finally worn out and becoming useless.

The action of the springs *s* serves to always keep the pulleys pushed toward the fulcrum-rings and the ends of the levers in the depressed seats or bearings *i i* of those rings.

Set-screws *z*, Figs. 1 and 6, are employed with the spiders to hold the latter true with the shaft, so that their friction-surfaces shall bear truly and fairly against the friction-surfaces of the respective driving-pulleys. These set-screws are inserted in the hubs of the spiders opposite the splines *c*.

The contact-surfaces between the rigid collars *g g* and the fulcrum-rings *h h* may be lubricated by any simple means, and I usually prefer to form the contiguous face of either one or the other with a groove *a'*, Fig. 12, to allow the oil to enter between the parts.

What I claim as my invention is—

1. In a counter-shaft, a shaft having pulley and friction wheels adjacently mounted thereon, levers engaging said pulley-wheels, a shifting head mounted on said shaft, annularly-movable friction-cheeks secured to said head and adapted to engage said levers, a rigid annular band secured to said shaft and adjacent to said head, a fulcrum-band having openings therein adapted to receive the short arms of the aforesaid levers, said fulcrum-ring being journaled on said shaft and adjacent to said band, said parts being combined substantially as described.

2. In a counter-shaft, a shaft having pulley-wheels journaled thereon, friction-wheels adjacent thereto, levers engaging said pulley-wheels, a shifting head mounted on said shaft, friction-cheeks mounted on the outer end of said head and having annular recesses in the outer ends thereof, a band having openings therein adapted to enter said recesses, fasteners adapted to pass through said openings and engage said head, a rigid band secured to said shaft and a fulcrum-ring freely mounted on said shaft adjacent to said band and adapted to engage the fulcrums of said levers, said parts being combined substantially as described.

3. In a counter-shaft, a shaft with pulley and friction wheels journaled thereon, levers on said pulley-wheels, a shifting head with friction-cheeks on the ends thereof adapted to engage said levers, a rigid band mounted on said shaft between said head and pulley-wheel, a fulcrum-ring mounted on said shaft, its inner face adapted to engage said band and having openings in its outer face adapted to receive the fulcrums of said levers and a plunger having lugs secured thereto also mounted on said shaft between said pulley and friction wheels, said parts being combined substantially as described.

4. A counter-shaft having pulley and friction wheels mounted thereon, levers secured to said pulley-wheels, rigid bands mounted on said shaft, fulcrum-rings encircling said shaft adjacent thereto, said fulcrum-rings having openings therein, adapted to engage the fulcrums of said levers, and lubricating-grooves, a shifting head mounted on said shaft and between said bands, friction-cheeks on the ends of said head adapted to engage said levers, plungers mounted on said shaft, lugs on said plungers, springs in openings in the hubs of said friction-wheels adapted to engage said lugs, adjustable collars on said shaft outside of said pulley-wheels, flanges on each end of said collars and fastening means provided between said flanges, all of said parts being combined substantially as described.

In witness whereof I have hereunto set my hand, this 20th day of August, 1895, in the presence of two subscribing witnesses.

JESSE H. BROWN.

Witnesses:
J. B. ECCLESTON,
J. A. ATWELL.