T. C. HARGRAVE.

DEVICE FOR CHANGING THE SPEED OF MACHINERY.

No. 82,941. Patented Oct. 13, 1868.

Witnesses;
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THOMAS C. HARGRAVE, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO HIMSELF, WILLIAM B. CHARLTON, AND H. K. MOORE.

Letters Patent No. 82,941, *dated October* 13, 1868.

IMPROVEMENT IN DEVICE FOR CHANGING THE SPEED OF MACHINERY.

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, THOMAS C. HARGRAVE, of Boston, in the county of Suffolk, and State of Massachusetts, have invented an Improved Device for Changing the Speed of Machinery, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan of my improved device.

Figure 2 is an end elevation of the same.

Figure 3 is a section on the line *x x* of fig. 1.

Figure 4 is a section on the line *y y* of fig. 1.

This invention consists in an arrangement of mechanism by which the speed of machinery may be expeditiously changed without any cessation of movement, and without the sudden jerk which is experienced where the ordinary clutch is employed.

To enable others skilled in the art to understand and use my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings, A represents an ordinary drum or pulley, the shaft, *b*, of which runs in bearings in the standards *c c*, and from this drum motion is communicated to the pulleys B C, by means of a belt, D, which is shifted from one to the other by a shipper-lever, E, operated by hand or automatically, by means of suitable connections.

The manner in which the motion of the pulleys B and C is communicated to the driving-shaft of the machine will now be described.

The pulley B is permanently secured to the outer end of a hollow shaft, *d*, which revolves on a stationary shaft, *e*, projecting out horizontally from a standard, G, rising from the bed H, and to the opposite extremity of the shaft *d* is secured a gear, I, which engages with a gear, K, of the same diameter, which runs on a short horizontal shaft or stud, *f*, projecting out from the standard G

Over the hollow shaft *d* is fitted, so as to revolve freely thereon, another hollow shaft, L, which carries the pulley C, and to the inner extremity of the shaft L is secured a gear, *g*, which engages with a larger gear, M, secured to the gear K. and revolving therewith on the stud *f*.

These gears K M are placed upon a stationary stud, *f*, for convenience in illustrating my invention; but in practice they are intended to be both keyed to the driving-shaft of the machine to which my improved device for changing speed is applied.

The end of the shaft L opposite to the gear *g* bears against a boss or projection, 5, on the inner face of the pulley B, and thus serves to prevent the inner edges of the pulleys B and C from coming into contact with each other.

When the belt is upon the pulley B, its motion will be communicated through the shaft *d* to the gear I, which engages with the gear K, and these gears being of equal size, the driving-shaft of the machine will be revolved at the same speed as the pulley B; but when the belt is shifted on to the pulley C, the motion is communicated through the hollow shaft L to the gear *g*, which engages with the gear M; and the gear *g*, having but about one-half the number of teeth of the gear M, the driving-shaft will be revolved at only one-half the speed of the pulley C, and consequently the machine is driven at only one-half the speed when the belt is on the pulley C, that it is when the belt is on the pulley B, and it will be seen that the several gears are so connected together, that, whether the belt is on the pulley B or C, they will both be revolved simultaneously, although at different rates of speed. By changing the relative sizes of the gears, the proportional rate of speed communicated from the pulley B or C may be varied as desired, and it is evident that if more than two different rates of speed should be required, the number of pulleys may be increased, each one having an independent hollow shaft, provided with a gear engaging with another gear on the driving-shaft of the machine. In general, however, only two different rates of speed are required.

The above-described device for changing the speed of machinery while it is in motion, is simple, compact, and not liable to get out of order, while it may be applied to any description of machinery in which it is desirable to change the rate of speed expeditiously, without any sudden jerk, and without any cessation of motion.

Claim.

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

The pulleys B C, secured to independent shafts *d* L, revolving one within the other, and connected, by means of gears I K and *g* M, to the driving-shaft of the machine, the pulley A and belt-shipper E, by means of which the rate of speed may be expeditiously changed, the whole combined and arranged substantially as described.

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Witnesses:

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