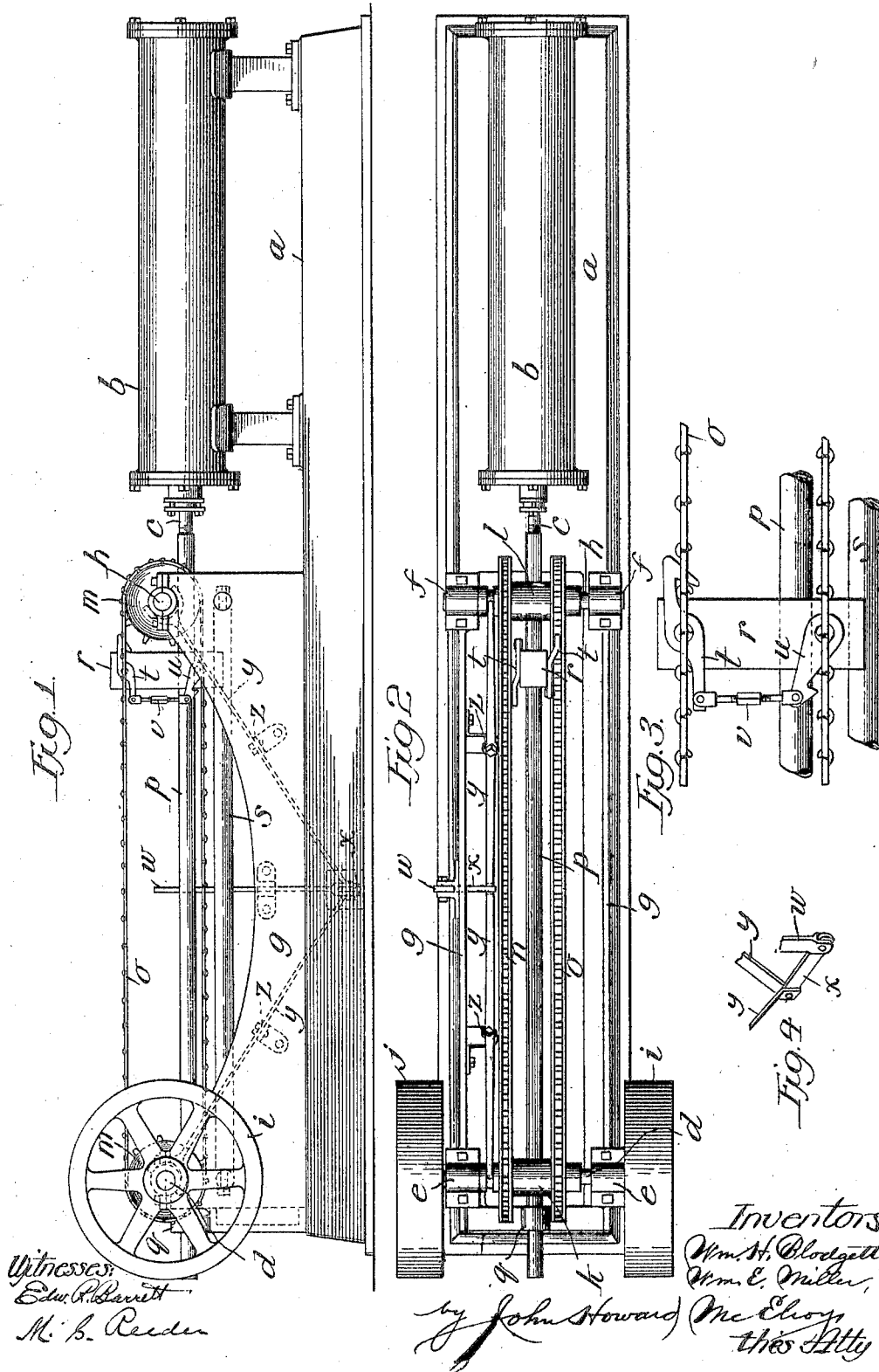


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PATENTED FEB. 6, 1906.

W. H. BLODGETT & W. E. MILLER.
CENTERLESS ENGINE.

APPLICATION FILED MAY 6, 1905.



UNITED STATES PATENT OFFICE.

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CENTERLESS ENGINE.

No. 811,688.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed May 6, 1905. Serial No. 259,132.

To all whom it may concern:

Be it known that we, WILLIAM H. BLODGETT, residing at Los Angeles, in the county of Los Angeles and State of California, and WILLIAM E. MILLER, residing at Boise, in the county of Ada and State of Idaho, citizens of the United States, have invented certain new and useful Improvements in Centerless Engines, of which the following is a specification.

Our invention is concerned with an engine provided with novel means for changing the reciprocating movement of the piston-rod into a rotary movement of the fly-wheel shaft in such a manner that there can be no dead-centers, as is the case with engines as constructed with the ordinary crank and connecting-rod.

Our invention is further concerned with a novel reversing mechanism by which the direction of rotation of the shaft may be changed without reversing the direction of movement of the piston.

To illustrate our invention, we have annexed hereto a sheet of drawings, in which the same reference characters are used to designate identical parts in all the figures, of which—

Figure 1 is a side elevation of an engine embodying our invention. Fig. 2 is a top plan view of the same. Fig. 3 is a detail, on enlarged scale, showing the dogs for engaging the driving-chains; and Fig. 4 is a perspective detail, on enlarged scale, showing a part of the connections for reversing the engine.

In carrying out our invention we mount upon a bed-plate *a* the steam-cylinder *b*, which may be of any desired form of construction, but which preferably has a longer stroke than is ordinarily employed. This cylinder will be provided with a steam chest and valve and other suitable gear for reversing the valves automatically, which will be operated by the piston-rod in any desired manner. We have not herein shown the steam-chest and valve-gear, for the reason that it forms no part of our present invention, which is concerned solely with the means for transforming the reciprocating movement of the piston into the continuous rotary movement of the fly-wheel shaft *d*.

In a suitable pair of bearings *e* and *f*, supported upon the ends of the side pieces *g* of the bed-plate, are the shafts *d* and *h*, respec-

tively. The fly-wheel shaft *d* is preferably provided with a fly-wheel *i* and a belt-wheel *j*, and the shaft *h* may be similarly provided, if desired, or one shaft may have two fly-wheels and the other two belt-wheels, or any desired arrangement, the purpose being to provide sufficient momentum to the shafts to insure their continuing their rotation at the instant the piston is reversing its direction of movement. Splined upon the shafts *d* and *h* are the sleeves *k* and *l*, which have rigidly secured on the ends thereof the sprocket-wheels *m*, which are connected by the pair of sprocket-chains *n* and *o*, as clearly shown in Fig. 2. The piston-rod *c* has a continuation thereof which may conveniently take the form of a tube *p*, which preferably has a sliding bearing at *q*, formed on the end of the bed-plate casting. The tube *p* has rigidly secured thereto the cross-head *r*, the lower end of which is grooved and slides upon the bearing rod or tube *s*, which is suitably supported at its ends from the casting *g*. On each side of the cross-head *r* is pivoted a pair of dogs *t* and *u*, which have hook-shaped ends suitably shaped and offset, so as to overhang the chains *n* and *o* and engage with the links thereof to drag the chain with the cross-head as it is moved in either direction. With the cross-head moving to the left, as seen in Fig. 3, the dog *t* will engage the upper portion of the chain and carry it with it, thus rotating the shaft *d* from right over to left. At the same time the dog *u* is held out of engagement with the lower half of the chain, the two dogs being connected by the adjustable link *v*, which can be lengthened or shortened, as may be desired, to secure the desired distance between the dogs. At the end of the stroke of the piston to the left as soon as it starts to the right the under side of the hook of the dog *t* will rise over the link of the chain in which it is hooked by reason of the cam shape of the nose, and as it rises the hook of the dog *u* will be forced down into engagement with the lower part of the chain, so that the chain is engaged by the lower dog as soon as the piston-rod starts in the opposite direction, and during the slight interval between engagements the momentum of the shafts and their fly-wheels will keep them in movement, so that the rate of speed is practically uniform.

To reverse the direction of rotation of the shafts *d* and *h* without changing the direction

of movement of the piston, we employ the shifting-lever *w*, which is pivoted to the casting *g* at one side thereof and has its fork-shaped lower end embracing and pivoted to the link *x*, which is in turn pivoted to the lower ends of the levers *y*, which in turn are pivoted at *z* to the castings *g* and have their fork-shaped upper ends engaging the annular grooves in the sleeves *k* and *l* in the customary manner, as in clutch-shifting mechanism, so that by moving the upper end of the lever *w* the sleeves *k* and *l* can be moved from one side to the other, so that the dogs *t* and *u* will be disengaged from one chain and engaged by the other chain, and by this means the direction of rotation of the shafts may be reversed at will.

What we claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a device of the class described, the combination with the pair of driven shafts, and a sprocket-wheel on each of said shafts, of the chain connecting said wheels, the cross-head reciprocating adjacent the chain, the pawls adapted to engage the two runs of the chain for the purpose described, and the adjustable link connecting the pawls and adapted to regulate their engagement with the chain.

2. In a device of the class described, the combination with the pair of driven shafts, and a sprocket-wheel on each of said shafts, of the chain connecting said wheels, the cross-head reciprocating adjacent the chain, the pawls adapted to engage the two runs of the chain for the purpose described, and a link engaging the head of one pawl and the tail of the other.

3. In a device of the class described, the combination with a pair of driven shafts, and a sprocket-wheel on each of said shafts, of the chain having horizontal runs connecting said wheels, the cross-head reciprocating adjacent the chain, the hook-shaped pawls having cam-surfaces on the hooks and adapted to alternately engage the two runs of the chain, and a link connecting the pawls.

4. In a device of the class described, the combination with a pair of driven shafts and a sprocket-wheel on each of said shafts, of the chain having horizontal runs connecting said wheels, the cross-head reciprocating adjacent the chain, a pawl carried by said cross-head and adapted to engage the outer side of the upper run of the chain, another pawl carried by the cross-head and adapted to engage the inner side of the other run of the chain, and a link connecting said pawls.

5. In a device of the class described, the combination with a pair of driven shafts and a sprocket-wheel on each of said shafts, of the chain connecting said wheels, the cross-head reciprocating adjacent the chain, a pawl carried by said cross-head and adapted to en-

gage the outer side of the upper run of the chain, another pawl carried by the cross-head and adapted to engage the inner side of the other run of the chain, and a link connecting the tail of the upper pawl with the head of the lower pawl.

6. In a device of the class described, the combination with a pair of driven shafts and a sprocket-wheel on each of said shafts, of the chain connecting said wheels, the cross-head reciprocating adjacent the chain, the hook-shaped pawls adapted to alternately engage the two runs of the chain, and having the cam-surfaces formed on the hooks, and an adjustable link connecting the pawls and adapted to regulate their engagement with the chain.

7. In a device of the class described, the combination with a pair of driven shafts and a sprocket-wheel on each of said shafts, of the chain connecting said wheels, the cross-head reciprocating adjacent the chain, the hook-shaped pawl *t* having the cam-surface formed on the hook and adapted to engage the outer side of the upper run of the chain, the hook-shaped pawl *u* having the cam-surface on the hook and adapted to engage with the inner side of the other run of the chain, both of said pawls being carried by the cross-head, and an adjustable link *v* connecting the tail of the pawl *t* with the head of the pawl *u*.

8. In a device of the class described, the combination with a pair of driven shafts and a pair of sprocket-wheels on each of said shafts, of the pair of sprocket-chains connecting said wheels, the cross-head reciprocating adjacent the chains, mechanism carried by said cross-head adapted to engage the upper or lower run of one or the other of said chains, and means for determining which of said chains shall be engaged and thereby the direction of rotation of the shafts controlled.

9. In a device of the class described, the combination with a pair of driven shafts and a pair of sprocket-wheels on each of said shafts, of the pair of sprocket-chains connecting said wheels, the cross-head reciprocating adjacent the chains, mechanism carried by said cross-head adapted to engage the upper or lower run of one or the other of said chains, and means for causing relative lateral movement of the chains and cross-head to determine which of said chains shall be engaged and thereby the direction of rotation of the shafts controlled.

10. In a device of the class described, the combination with a pair of driven shafts and a pair of sprocket-wheels on each of said shafts, of the pair of sprocket-chains connecting said wheels, the cross-head reciprocating adjacent the chains, mechanism carried by said cross-head adapted to engage the upper or lower run of one or the other of said chains, and means for moving the chains laterally to determine which of them shall be engaged by

the mechanism on the cross-head and thereby the direction of rotation of the shafts controlled.

11. In a device of the class described, the combination with a pair of driven shafts and a pair of sprocket-wheels on each of said shafts, of a pair of sprocket-chains connecting said wheels, the cross-head reciprocating adjacent the chains, mechanism carried by said cross-head adapted to engage the upper or lower run of one or the other of said chains, and means for moving the sprocket wheels and chains laterally to determine which of them shall be engaged by the mechanism on the cross-head and thereby the direction of rotation of the shafts controlled.

12. In a device of the class described, the combination with a pair of driven shafts each carrying a sleeve splined thereon, of a pair of sprocket-wheels secured on each of said sleeves, a pair of sprocket-chains connecting said wheels, the cross-head reciprocating adjacent the chains, mechanism carried by said cross-head adapted to engage the upper or lower run of one or the other of said chains, and means for moving the sleeves longitudinally of their shafts to determine which of said chains shall be engaged by the mechanism and thereby the direction of rotation of the shafts controlled.

13. In a device of the class described, the combination with a pair of driven shafts, each carrying a sleeve splined thereon and having

the channel therein, of the pair of sprocket-wheels carried by each of said sleeves, the pair of sprocket-chains connecting said wheels, the cross-head reciprocating adjacent the chains, mechanism carried by said cross-head adapted to engage the upper or lower run of one or the other of said chains, the yoke-shaped levers engaging the usual channels in the sleeves, and means for moving said yoke-shaped levers.

14. In a device of the class described, the combination with a pair of driven shafts, each carrying a sleeve splined thereon and having the channel therein, of the pair of sprocket-wheels carried by each of said sleeves, the pair of sprocket-chains connecting said wheels, the cross-head reciprocating adjacent the chains, mechanism carried by said cross-head adapted to engage the upper or lower run of one or the other of said chains, the yoke-shaped levers engaging the usual channels in the sleeves, and means for moving said yoke-shaped levers, consisting of the common lever connecting the upper ends of said yoke-shaped levers.

In witness whereof we have hereunto set our hands this 26th day of April, 1905.

WILLIAM H. BLODGETT.
WILLIAM E. MILLER.

Witnesses:

JOHN H. McELROY.
M. S. REEDER.