(No Model.) 3 Sheets—Sheet 1.

G. W. MORRIS.

MACHINERY FOR OPERATING STEAM PLOWS.

No. 385,520. Patented July 3, 1888.

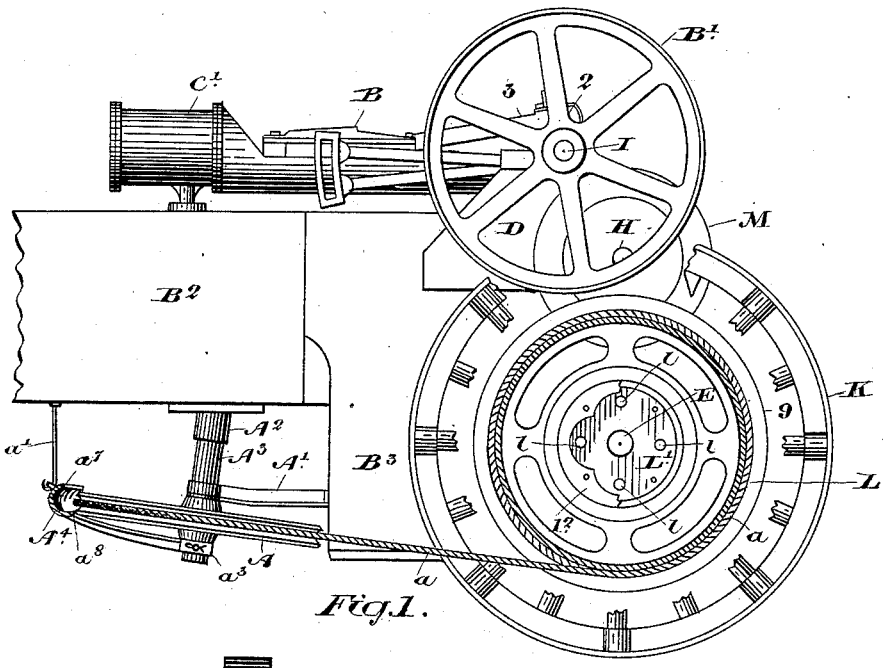

Fig. 1.

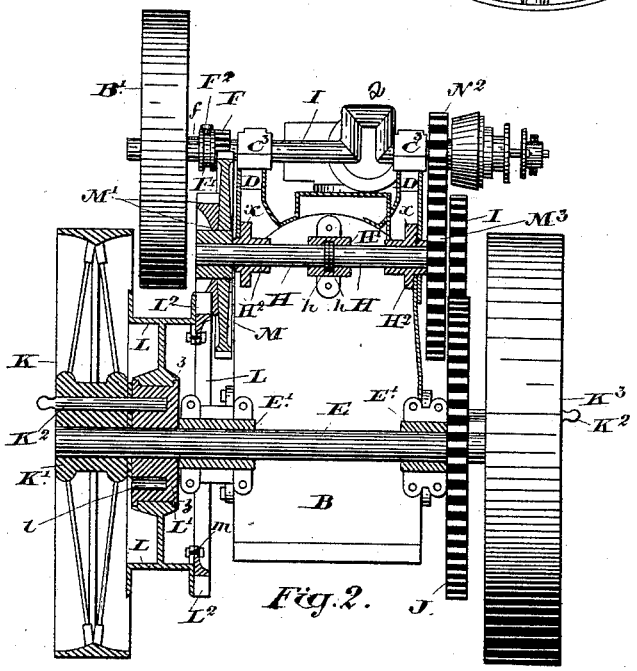

Fig. 2.

Witnesses.

J. Edw. Mayhew

Chas. H. Riches.

Inventor.

Geo. W. Morris.

by Donald C. Ridout & Co

Atty's

(No Model.) 3 Sheets—Sheet 2.

G. W. MORRIS.

MACHINERY FOR OPERATING STEAM PLOWS.

No. 385,520. Patented July 3, 1888.

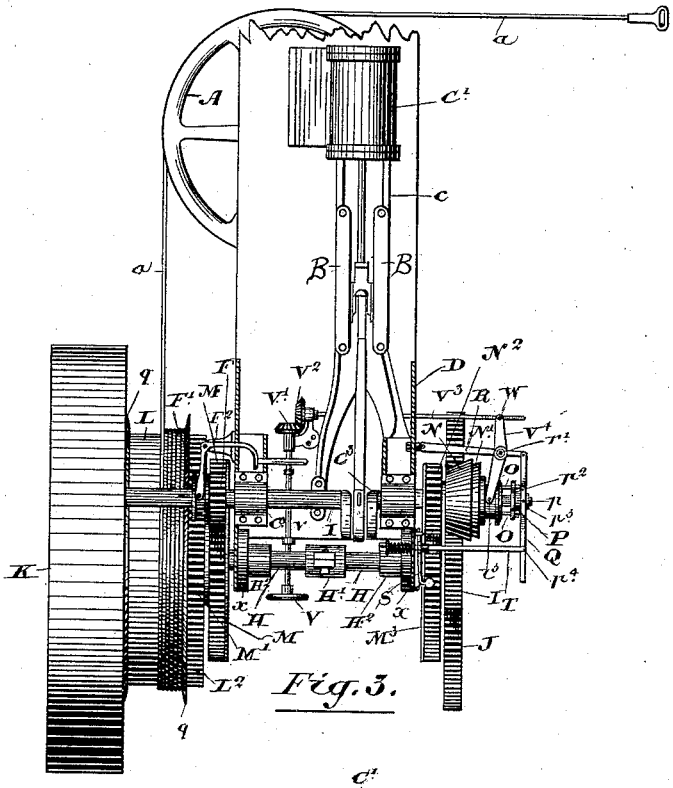

Fig. 3.

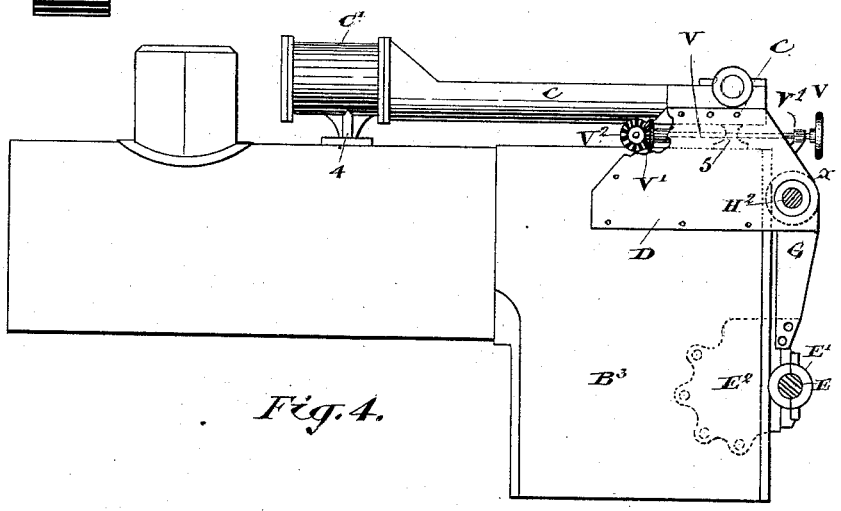

Fig. 4.

Witnesses.
F. B. Fehrenbach.
J. M. Jackson.

Inventor.
Geo. W. Morris.
by Donald C. Ridout & Co.
Attys.

(No Model.) 3 Sheets—Sheet 3.

G. W. MORRIS.

MACHINERY FOR OPERATING STEAM PLOWS.

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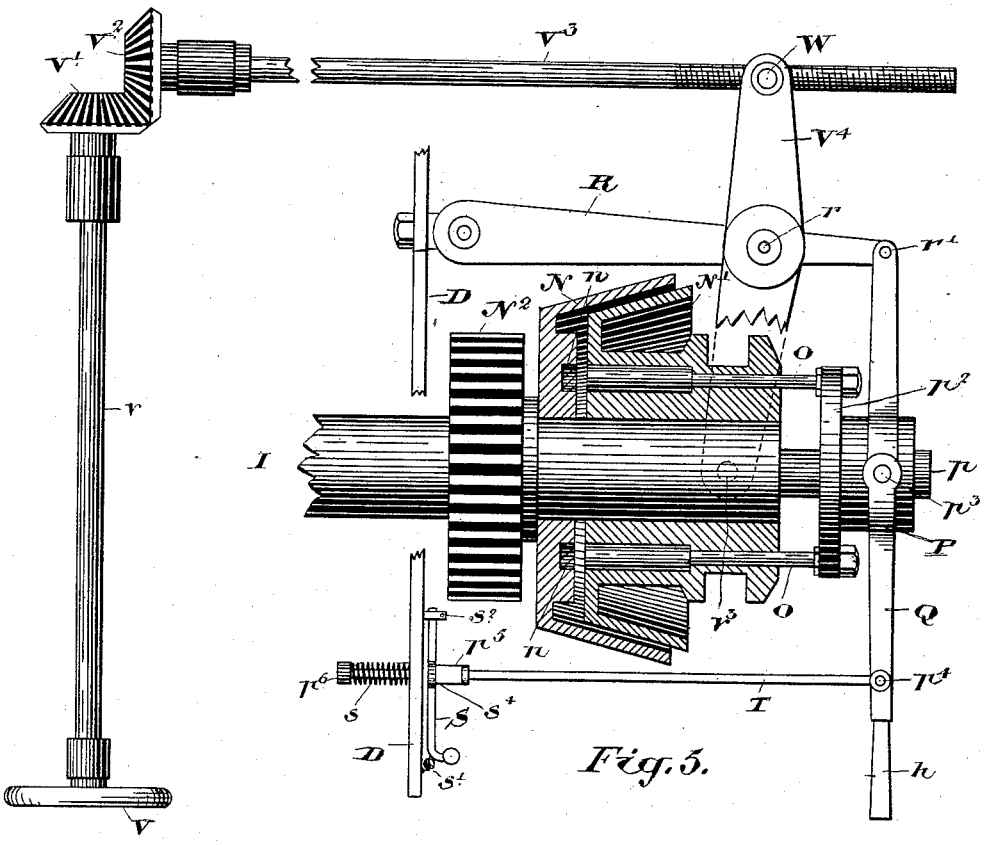

Fig. 5.

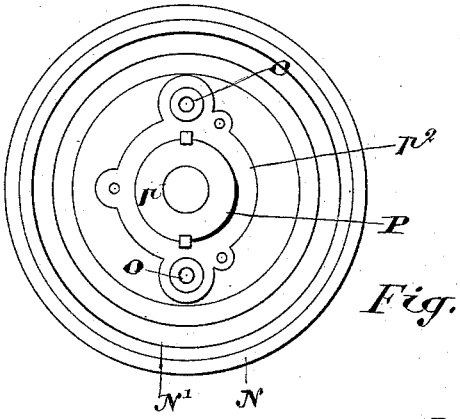

Fig. 6.

Witnesses.
F. B. Fehrenbach.
J. McJackson.

Inventor.
Geo. W. Morris.
by Donald C. Ridout & Co
Attys

UNITED STATES PATENT OFFICE.

GEORGE W. MORRIS, OF BRANTFORD, ONTARIO, CANADA, ASSIGNOR TO ALFRED WATTS, OF SAME PLACE.

MACHINERY FOR OPERATING STEAM-PLOWS.

SPECIFICATION forming part of Letters Patent No. 385,520, dated July 3, 1888.

Application filed October 20, 1887. Serial No. 252,912. (No model.)

To all whom it may concern:

Be it known that I, GEORGE WILLIAM MORRIS, of the city of Brantford, in the county of Brant, in the Province of Ontario, Canada, manufacturer, have invented certain new and useful Improvements in Machinery for Operating Steam-Plows, of which the following is a specification.

The object of the invention is to provide simple, cheap, and effective machinery for a steam-plow operated by an engine, which may be adapted, when desired, to the various uses to which an agricultural engine is required to be put, and whereby all the advantages of the double-engine system of steam-plow tackle may be secured without any of its disadvantages, and which can be utilized in either the single or double engine system, as well as in drawing the plow by direct traction, in such a manner that all the objections applicable to the direct traction and double-engine systems are entirely overcome.

By my improvements great strength and rigidity are secured for the various operative parts, as well as a means for applying the power of the engine in the several directions required when operating by either the single or double engine system of steam-plowing; and these improvements consist, essentially, in placing the winding-drum on the main axle adjoining one of the road-wheels and operated by gearing driven from the crank-axle, and suitable means for readily throwing the driving-gear for the road-wheels, as well as for the winding-drum, into and out of gear, and a grooved pulley placed under the boiler to receive the plow-rope from the winding-drum and change the direction of the pull when plowing with two engines.

Figure 1 is a side elevation, some of the parts being removed or broken away. Fig. 2 is an end elevation, partly in section. Fig. 3 is a plan showing gearing and the mode of operating same. Fig. 4 is a side elevation with wheels, gearing, &c., removed, indicating the gearings for crank-shaft, counter-shaft, main axle, and other operative parts. Fig. 5 is a detail of my positive and friction clutch on crank-shaft for operating the road-wheels. Fig. 6 is a top plan view of my positive and friction clutch.

In the drawings like letters and numerals of reference indicate similar parts in the various figures.

In Fig. 1, B^2 is the boiler, and B^3 the fire-box, and C′ is the cylinder in which the piston works. B are the guide-bars for the cross-head, and 3 the connecting-rod, and 2 the crank on the crank-shaft I. The guide-bars, the cylinder-cover, and main bearing-piece C are a single casting, which affords bearings for the crank-shaft, as more fully illustrated in Figs. 3 and 4. B′ is the fly-wheel on the crank-shaft.

D is the saddle-bracket bolted to the fire-box and main bearing-piece C, and which affords bearings for the divided counter-shaft H and wheel V, which operates the friction-clutch N N′. (*Vide* Figs. 3, 4, and 5.)

In Fig. 4 the bearing V^4 for shaft of wheel V is shown bolted to the saddle-bracket D, and the manner of placing the saddle-bracket D on the fire-box B^3, to which it is bolted for the purpose of supporting in position the main bearing-piece C and box-bearings for the crank-shaft, is shown more particularly in this figure.

M indicates the position of spur-wheel on counter-shaft.

K is one of the road-wheels, with spokes broken out and hub removed so as to view the winding-drum L, one of the rims 9, between which the rope is wound having been removed.

L′ is the hub for drum L, a portion of covering-plate l^2 being broken away so as to view the holes *l*, formed in the drum-hub, adapted to receive the bolting-pins K^2 for road-wheel. This drum-hub L′ is keyed onto the main axle E, and on it the winding-drum L is adapted to revolve when actuated by the gearing. (*Vide* also Figs. 2 and 3.)

a is the plow-rope wound on the drum, and here shown passing over the grooved pulley A, and thence passing at an angle to the plow when the double-engine system of plowing is adopted. For direct traction this grooved pulley A is of course not required. This pulley A is preferably used in a nearly horizontal position, as shown, and is placed near to and in front of the fire-box and immediately under the boiler, and has bearings for its shaft A^3 in the socket A^2, which is bolted to the bottom of the boiler, and the bracket A′, which has two legs spread apart and bolted to the fire-

box, the bearing-collar for the shaft being at the apex of this triangular-shaped support.

A^4 is a guard rigidly attached to the collar a^3, fixed to the shaft A^3, on which the wheel A is adapted to revolve. This guard is for the purpose of preventing the rope *a* from falling out of the groove in wheel A, should the rope *a* become slackened up; it may be further strengthened or held in position by the rod or wire *a'*, connecting it with the bottom of the boiler. It is lipped at a^7 and has a shoulder, a^8, which acts as a guide for the rope into the groove of wheel A.

In Fig. 2, the end elevation, the relative positions of the crank-shaft I, divided counter-shaft H, and main axle E, are more fully illustrated, the crank-axle being slightly to the front of the counter-shaft while the counter-shaft is vertically over the main axle, as seen in Fig. 1. In this view the pinion-wheel F on crank-shaft is shown in gear with the spur-wheel M on the divided counter-shaft, and ready to operate the winding-drum. When this pinion F is in gear and causing the winding-drum to revolve, the pinion-wheel N^2 is not clutched by the friction or positive clutch, (indicated at the right of the shaft, and more fully specified hereinafter under Fig. 5.)

F' is a collar formed on the end of the pinion-wheel F, and adapted to carry the end of the shifting-lever F^2, (shown in Fig. 3,) which moves the pinion-wheel F along the shaft on the feather-key *f* into and out of gear with spur-wheel M.

When the engine has taken up the desired position, and it is required to wind the drum so as to draw the plow, the pinion-wheel F is thrown into gear with the spur-wheel M and the engine started. The spur-wheel M being caused to revolve, carries with it the pinion M', which is fastened on the spur-wheel M. The teeth on the pinion M' mesh with the teeth on the periphery of the driving gear-wheel L^2, which may be bolted on or rigidly attached to the drum, as shown, by bolts *m*, and drives this gear-wheel L^2, which carries the drum round on the hub L', which is keyed to the main axle. Suitable flanges, *z*, are formed on the hub of the drum, overlapping the flange of the hub L', so as to prevent the entrance of sand and grit between the faces of the hub on the drum and the hub L'.

When it is desired to cease winding the plow-rope *a*, the pinion F is thrown out of gear with the spur-wheel M by the shifting-lever F^2 and moved along the feather-key *f* toward the fly-wheel B'. When the engine is to be moved ahead and the road-wheels driven, the pinion-wheel F being thrown out of gear, the pinion-wheel N^2 is thrown into clutch, as specified hereinafter under Fig. 5, and caused to partake of the motion of the crank-shaft I. The teeth on pinion-wheel N^2 meshing with the teeth on the driving spur-wheel M^3 on the divided counter-shaft causes it to revolve, carrying with it the pinion-wheel I formed or cast on its face. This pinion-wheel I meshes with the driving gear wheel J for road-wheel K^3, which communicates its motion by means of pin K^2, which passes through the hub of the road-wheel K^3, engaging in a hole formed in the hub of this larger gear-wheel J, which is keyed fast to main axle E, and thereby communicates its motion to the main axle. The main axle E, revolving through its bearing-boxes E', carries with it the hub L', on which the winding-drum revolves, and the bolting-pin K^2, passing through a hole in the hub K' of road-wheel into one of the holes in the hub L', causes the road-wheel K to partake of the motion of the drum-hub L'. If it is desired to turn sharp to the left or right, the pin K^2 can be removed from the road-wheels K or K^3 during the operation of turning, and replaced when it is desired to move ahead. The mode of supporting the boxes C^3 for the crank-shaft on the saddle-bracket D, which is bolted to the boiler, is shown, as well as the bearings H^2, (having collars *x*,) for the divided counter-shaft H. This counter-shaft H is divided in the center and is composed of two pieces. Each piece has formed at its end the rings *h'*, adjoining each other in the box H', which affords bearings for the inner ends of this divided counter-shaft, the collars or rings *h'* working in grooves formed in the box H, so as to prevent lateral motion. It can thus be seen that the spur-wheel M on this divided counter-shaft H, which drives the winding-drum, can be driven independently of the spur-wheel M^3, which drives the road-wheels. One wheel may be at rest while the other is working. This bearing H' for the ends of the divided counter-shaft H is bolted to the face of the fire-box B^3 in the boiler.

In Fig. 3, which is a plan showing the parts, as seen from above, A is the grooved pulley, (shown also in Fig. 1,) indicating the position of the plow-rope *a* when the double-engine system is employed, the engine being ready to move ahead in a direction of about a right angle to the line of draft as each furrow is completed. The various letters indicate the location of the various parts shown in the other figures. The position of the mechanism for operating the friction and positive clutches is also shown, (*vide* also Fig. 5,) V being the wheel for operating the friction-clutch lever, having bearings for the shaft *v* on top of the fire-box, V V^2 being the mitered gear-wheels which move the screw-shaft V^3 through the pivoted nut W on the screw-shaft. By turning the wheel V the screw-shaft moves the end of the lever V^4, which is pivoted at *r* on the standard, which is bolted to the saddle-bracket D. The end of this lever V^4 is forked and pivoted on trunnions v^3, formed on a collar on the male clutch N', and adapted to move the male clutch N' against the female clutch N, as desired, by moving the wheel V. This forms the friction-clutch, which is used when the engine is on different ground, so as to take any sudden strain off the parts of the engine when the road-wheels are started to move the en-

gine ahead, the positive clutch, which is formed by the lock-bolts O, entering holes *n*, formed in the female clutch N, as more fully described hereinafter under Fig. 5. When the engine is moving ahead freely, the positive clutch may be thrown in and used alone, or it may be used in conjunction with the friction-clutch if so desired.

In Fig. 4, C is the main bearing-piece which forms the cylinder-cover, guide-bars for cross-head, and bearings for crank-shaft. It is supported and attached to the top of boiler or fire-box, as indicated, by brackets 4 and 5.

D is the saddle-bracket, preferably of wrought-iron, which is bolted to main bearing-piece C and the fire-box B^3, and affords bearings H^2 for the divided counter-shaft H. The outer dotted circle, *x*, indicates the position of collar *x* (*vide* Fig. 2) behind this bracket D, which is shown bolted on the near side of the fire-box.

G is the gusset-piece, which is bolted to the inside of the saddle-bracket D, on the far side of the fire-box. The bearing for box of main axle E on the near side is omitted. The gusset-piece G extends downwardly and is bolted to the bearing for main axle E, and is a strengthening-piece. The main support for the bearing E′ for the main axle is the iron bracket E^2, which is bolted to the fire-box B^3, and is shown in dotted lines as it is on the far side of fire-box, holding the box E′ in position. The position of these boxes E′ is more clearly indicated by referring to Fig. 2, each box being supported by a bracket, E^2, bolted to each side of fire-box. The saddle-bracket D affords bearings for the shaft *v*, to which the wheel V for operating the friction-clutch is attached. The position of this shaft *v* on top of the fire-box B^3 and under the crank-axle I is also shown. The standard R for the positive and friction clutches is set out at right angles to the saddle-bracket D from one of the bolt-holes in the top thereof.

Fig. 5, the detail of the positive and friction clutch, indicates the mode of operation. The standard R, which is made of two pieces of bar-iron, is bolted on at right angles to the saddle-bracket D, from one of the upper bolt-holes, (shown in Fig. 4,) and carries pivoted thereon at *r* and *r*′ the friction clutch lever V^4 and positive-clutch lever Q for lock-bolts O. The mode of operating the friction-clutch has already been indicated, the male clutch-piece N′ being forced down into the female clutch-piece N by moving the pivoted nut W along the screw-shaft V^3 by revolving the wheel V, (*vide* also Figs. 3 and 4,) and is released from clutch by revolving the wheel V in a contrary direction. The positive-clutch lever Q is made of two bars bowed out into a circular form near the center and pivoted on the trunnions p^3 on the movable collar P, which is adapted to slide up and down on the spindle *p*, formed at the end of the crank-shaft I. The rod T is pivoted at p^4 to the lever-arm for lock-bolts Q near the handle end thereof, and the other end of the rod T passes through a hole in the saddle-bracket D. At p^5 there is a small collar formed on the rod T, against which a half-ring, s^4, formed on the latch S, is adapted to engage when the lock-bolts O are moved out of gear with the holes *n* in the female clutch-piece N. There is a nut, p^6, formed at the inner end of this rod, and a spiral spring, *s*, has bearings against this nut p^6, the saddle-bracket D being in compression, when as shown in this figure, and the lock-bolts O are out of the holes *n* in the female clutch-piece. There is also another small spiral spring, *s*′, attached to the latch S near the knob, and to the saddle-bracket D, holding the latch down against the rod T, and causing it to spring back after being raised. When it is desired to throw the positive clutch into action, the latch S, which is hinged at s^2, is raised up, releasing the collar p^5, and the rod T is drawn inwardly by the action of the spring *s*, thus drawing down the handle end of the lever Q, causing the movable collar P to move inwardly. Connected with this collar P is the head-piece p^2, (*vide* also Fig. 6,) which carries the lock-bolts O, the enlarged ends of which are adapted to move through recesses formed in the female clutch-piece N. As the male clutch-piece N′ is keyed onto the crank-shaft I and partakes of its motion, when the lever-arm Q is drawn inwardly by releasing the spring *s* when the latch S is raised, the lock-bolts O are shot into the holes *n*, formed in the bottom of the female clutch-piece N, and grip it. On the bottom of the female clutch-piece N is formed the pinion N^2, which thus partakes of the motion of the male clutch-piece N, and actuates the driving-gear for the road-wheels.

When it is desired to disengage the positive clutch, the latch S is slightly raised and the handle *h* on the lever Q is pushed out. When the collar p^5 has passed outside the latch S, the said latch is dropped and engages by the action of the springs *s s*′ with the collar p^5 on the rod T, holding the positive clutch in position out of gear. The mode of action of the friction-cluch operated by the lever-arm V^4, which is moved by the action of the screw-shaft V^3, being sufficiently apparent from what has been already specified, need not further be enlarged on.

Fig. 6 being a top view of part of the clutching apparatus, the different letters indicate the position of the several parts.

When the double-engine system of steam-plowing is utilized, the grooved pulley A, located under the boiler, serves to direct the draft-rope *a* to the plow in the required direction, the engine being caused to move forward as each furrow is completed.

By my improvements in gearing and attachments the steam-plow engine may be utilized in another and novel manner, so as to secure direct traction, as follows: The rope being wound on the drum and the end of it attached to the plow, the engine may be moved ahead, leaving the plow stationary, the rope unwind-

ing from the drum as the engine advances, and for the purpose of regulating the speed with which the rope is unwound a friction-brake may be applied to the winding-drum. When the engine arrives at a suitable place and on firm ground and is then fixed firmly in position, the pinion-wheel on the crank-shaft may be thrown into gear with the gearing which actuates the winding drum, the rope wound up by the power of the engine, and the plow drawn up to it. The engine may then again advance as before and repeat the operation. The winding-drum being on the same axle as the road-wheels, secures great rigidity and strength for my steam-plow, besides rendering it possible to dispense with a large amount of expensive gearing, which is necessary when the winding-drum is placed, as is usually the case, under the boiler of the engine, the multiplication of the old style of gearing causing loss of power, weakness, liability to accidents, and considerable expense.

What I claim as my invention is—

1. The combination, with the main axle E and the hub L′, keyed thereto, of the winding-drum L, rotatable on said hub, the crank-shaft I, the pinion F thereon, and an operative connection between said pinion and drum, substantially as described.

2. The combination of the hub L′, keyed to the main axle E and having holes *l* formed therein to receive bolt-pin K^2, road-wheel K, and the winding-drum L, having flanges *z* formed on its hub, and the driving gear-wheel L^2, driven by gearing actuated by the pinion-wheel F, keyed to the crank axle I, substantially as specified.

3. The combination of the hub L′, keyed to the main axle E, having bearings E′, holes *l*, formed in hub L′, bolt-pin K^2, road-wheel K, and the winding-drum L, the driving gear-wheel L^2, the pinion-wheel M′, formed on spur-wheel M, the divided counter-shaft H, the pinion-wheel F, and crank-axle I, substantially as described and specified.

4. The combination of the hub L′, keyed to the main axle E, the winding drum L, driving gear-wheel L^2, pinion-wheel M′, formed on spur-wheel M, the divided counter-shaft H, and the pinion-wheel F, secured to the crank-axle I and adapted to be thrown into and out of gear with the spur-wheel M on divided counter-shaft by the shifting-lever F^2, substantially as specified.

5. The combination of the pinion-wheel N^2, adapted to be clutched so as to partake of the motion of the crank-axle I, the spur-wheel M^3 on the divided counter-shaft, the pinion I, driving gear-wheel J, road-wheel K^3 on the main axle E, and the pin K^2, passing through a hole in the hub of the driving gear-wheel J, substantially as specified.

6. The combination of the pinion-wheel N^2, the clutch N N′, crank-axle I, the actuating-gear, the road-wheel K^3, pin K^2, main axle E, the drum L, keyed to the main axle and having holes *l*, and the pin K^2, which passes through the hub K′ of the wheel K, substantially as specified.

7. The combination of the main bearing-piece C, formed on the head of the cylinder and rigidly attached to the fire-box, having guide-bars for the cross-head of piston-shaft and bearing for crank-axle I, formed thereon, the saddle-bracket D, affording bearings for the divided counter-shaft H, the gusset-piece G, and the bearing E′, main axle E, and bracket E^2, substantially as specified.

8. The combination, with the female clutch-piece N and the pinion N^2, which actuates driving-gear for road-wheels, of the male clutch-piece N′, pivotally attached to the lever V^4, which is pivoted on the standard R, suitably supported on machine, the pivoted nut W, screw-shaft V^3, adapted to be actuated by mitered gearing V′ and V^2, and rod *v*, which is also adapted to revolve in suitable bearings formed in the fire-box, substantially as specified.

9. The combination, with the rod T, pivotally connected to the handle end, of positive-clutch lever Q, lock-bolts O, the collars p^5 and p^6 formed on said rod, the spring *s* and spring *s*′, having suitable bearings, and the hinged latch S, having half-collar s^4 formed thereon and adapted to engage with the collar p^5 formed on rod when the lock-bolts are disengaged from the female clutch-piece N, substantially as specified.

10. The combination, with the rod T, pivotally connected to the handle end, of the positive-clutch lever Q, lock-bolts O, clutch-piece N, with holes formed therein, and the spring *s*, having suitable bearings on the end of said rod and body of the machine, and adapted to throw the lock-bolts O into the holes *n*, formed in the base of the female clutch-piece N, when the hinged latch S is raised from the collar p^5, so as to release said spring *s* while the male clutch-piece N′ is revolving on the crank-shaft I, to which it is rigidly attached, substantially as specified.

11. A steam-plow in which the winding-drum which operates the plow is adapted to revolve on a hub formed on the main axle for road-wheels and contiguous to one of said wheels and operated independently of said road-wheels by suitable gearing driven by the crank-axle, in combination with a grooved pulley placed near to and in front of the fire-box and immediately under the boiler of the engine, and over which grooved pulley the rope to the plow from the winding-drum passes, substantially as described, and for the purpose specified.

Toronto, July 12, 1887.

GEORGE W. MORRIS.

In presence of—
CHAS. B. WATTS,
ROBT. BURBIDGE,
JOHN G. RIDOUT.