6 Sheets—Sheet 1

J. FOGARTY

Steam-Plow.

No. 211,843. **Patented Feb. 4, 1879.**

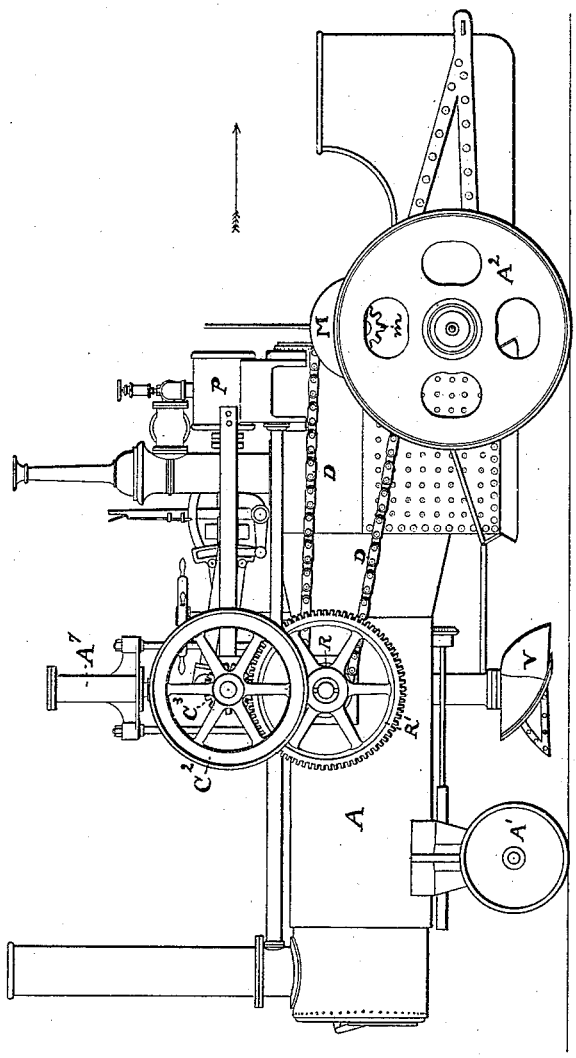


FIG. 1

WITNESSES:

W. C. Brookes

Otto Müller

INVENTOR:

James Fogarty

by his attorney

T. D. Stetson.

6 Sheets—Sheet 2.

J. FOGARTY.

Steam-Plow.

No. 211,843. Patented Feb. 4, 1879.

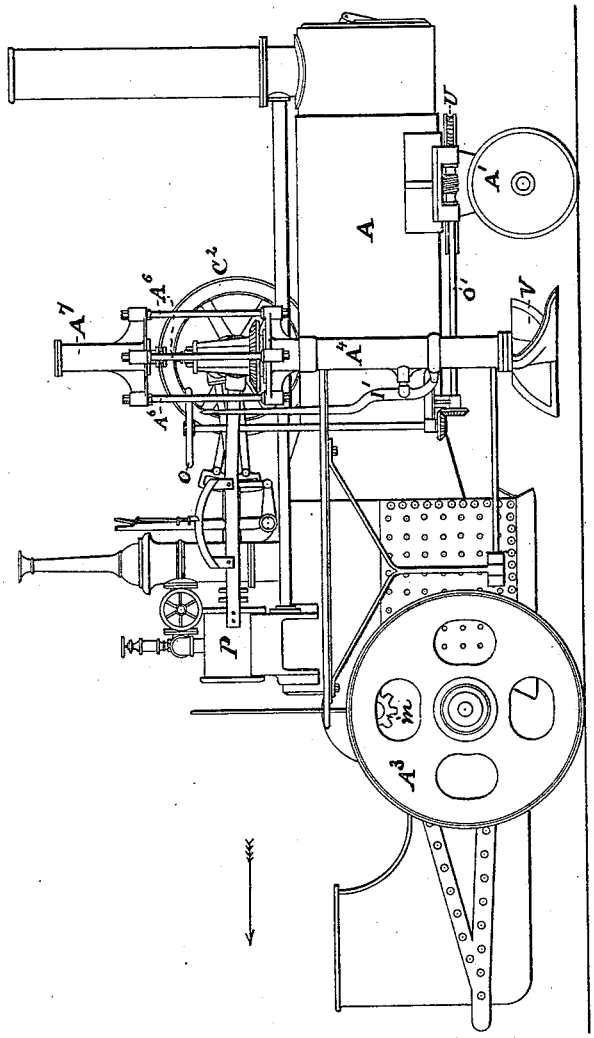


FIG. 2

WITNESSES:

W. C. Brookes

Otto Müller

INVENTOR:

James Fogarty
by his attorney
T. L. Stetson

6 Sheets—Sheet 3.

J. FOGARTY.

Steam-Plow.

No. 211,843. Patented Feb. 4, 1879.

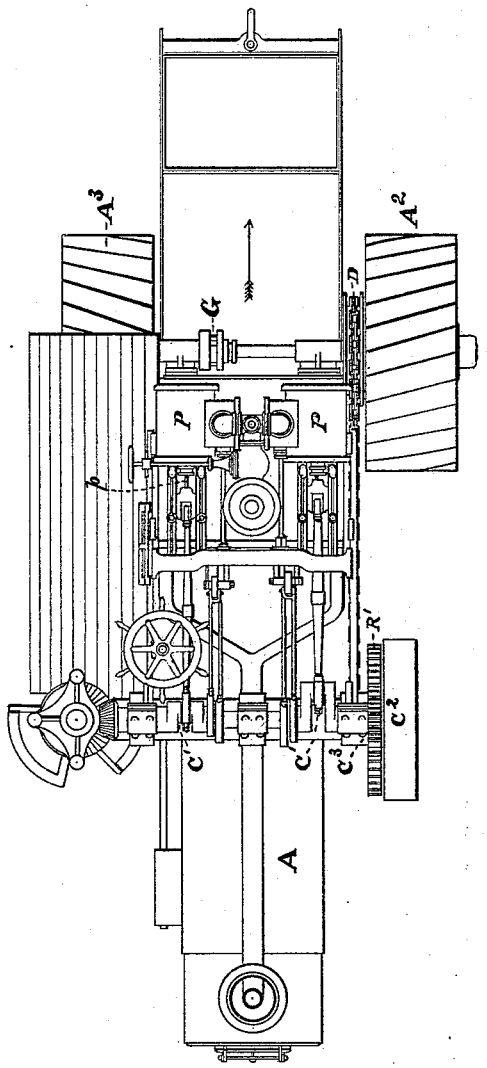


FIG. 3

WITNESSES:

W. C. Brookes

Otto Müller

INVENTOR:

James Fogarty

by his attorney

T. D. Stetson

6 Sheets—Sheet 4.

J. FOGARTY

Steam-Plow.

No. 211,843. **Patented Feb. 4, 1879.**

FIG. 14

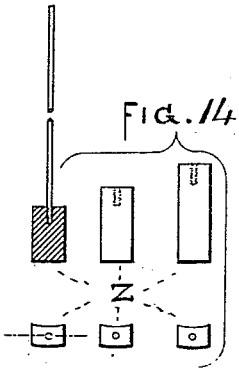


FIG. 4

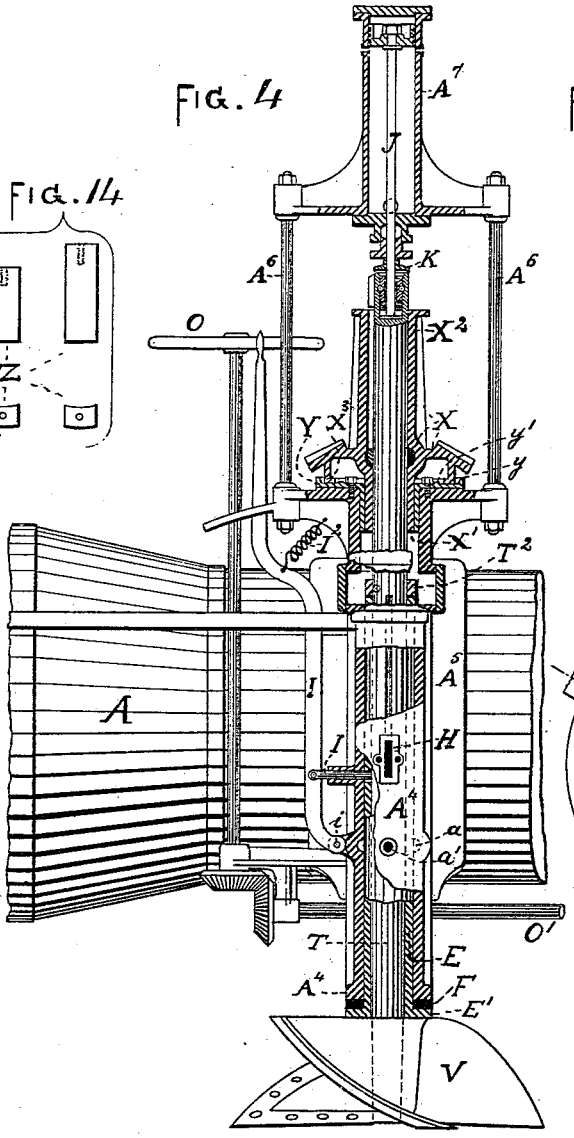


FIG. 6

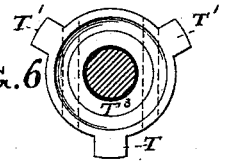


FIG. 5

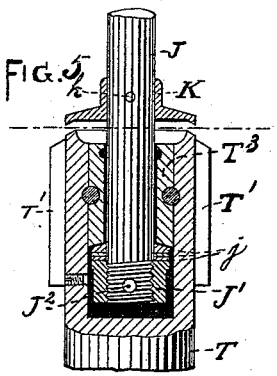
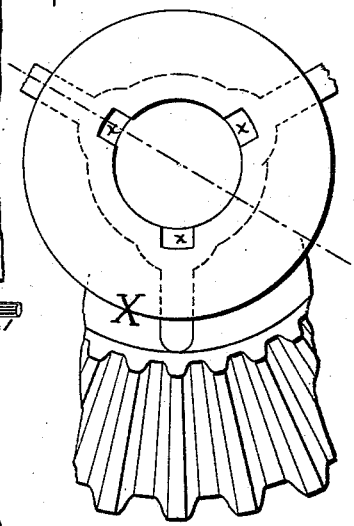


FIG. 7



WITNESSES:

W. C. Brookes

Otto Müller

INVENTOR:

James Fogarty

by his attorney

Thomas D. Stetson

6 Sheets—Sheet 5.

J. FOGARTY.

Steam-Plow.

No. 211,843. Patented Feb. 4, 1879.

FIG. 8

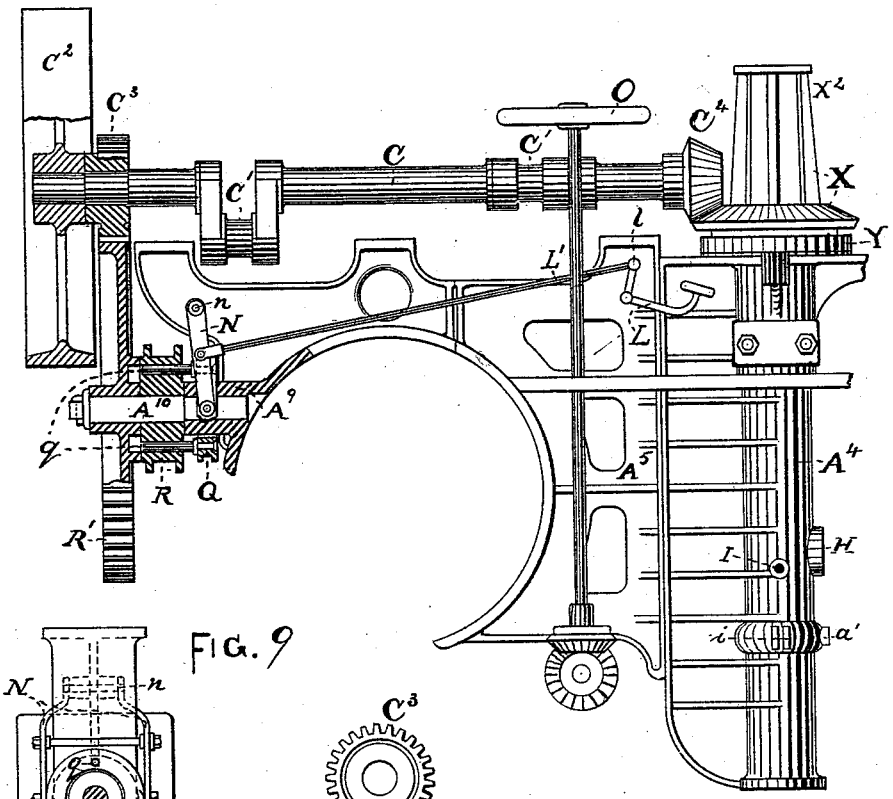


FIG. 9

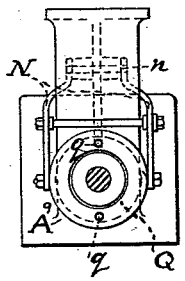
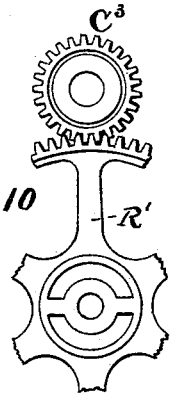


FIG. 10



WITNESSES:

W. C. Brookes

Otto Müller

INVENTOR:

James Fogarty
by his attorney
Thomas D. Stetson

6 Sheets—Sheet 6.

J. FOGARTY.

Steam-Plow.

No. 211,843. Patented Feb. 4, 1879.

FIG. 11

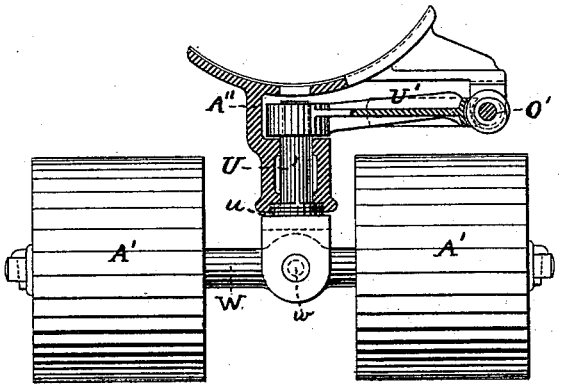


FIG. 12

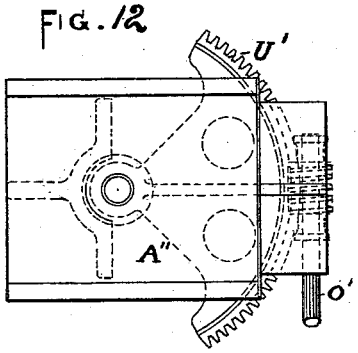
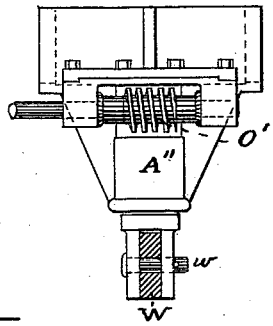


FIG. 13



WITNESSES:

W. C. Brookes

Otto Müller

INVENTOR:

James Fogarty
by his attorney
Thomas L. Stetson

UNITED STATES PATENT OFFICE.

JAMES FOGARTY, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN STEAM-PLOWS.

Specification forming part of Letters Patent No. **211,843**, dated February 4, 1879; application filed September 3, 1878.

To all whom it may concern:

Be it known that I, JAMES FOGARTY, of Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements Relating to Steam-Plows; and I do hereby declare that the following is a full and exact description thereof.

My improved plow is of the general construction set forth in my patent dated March 16, 1875, No. 160,760. I have conceived and wrought out several important improvements.

The accompanying drawings form a part of this specification, and represent what I consider the best means of carrying out the invention.

Similar letters of reference indicate like parts wherever they occur.

Figure 1 is a side elevation of the machine as seen from the right. Fig. 2 is a corresponding elevation as seen from the left. Fig. 3 is a plan view corresponding to Fig. 1.

The machine is capable of being driven either end foremost; but I have intended it mainly to move with the large wheels foremost and with the steering-wheels at the rear. This brings the chimney or smoke-pipe at the rear end of the machine, being the opposite of that usually preferred in locomotives. The remaining figures are details on a larger scale.

Fig. 4 is an elevation, partly in section, showing the plow-shaft and the parts immediately connected. Figs. 5, 6, and 7 are details thereof on a still larger scale. Fig. 5 is a vertical section, and Fig. 6 a horizontal section, showing the parts at the connection of the plow-shaft with the piston-rod by which it is elevated. Fig. 7 is a plan of a portion of the wheel and neck by which the plow-shaft is revolved. Fig. 8 shows the same and other connected parts, including the main driving-shaft and the stout frame-work which supports the plow-shaft and other working shafts. Fig. 9 is another view on the same scale of a portion of the framing and of a clutch used to connect and disconnect the propelling mechanism. Fig. 10 is another view of the change-gear used for the same purpose. Figs. 11, 12, and 13 relate to the wheels and connections used for supporting and steering. Fig. 11 is an elevation, partly in transverse vertical section. Fig. 12 is a plan view, showing some of the same parts. Fig. 13 is a side view, partly in section. Fig. 14 represents several views of what I term "filling-pieces," which serve to gage the depth to which the plow may be allowed to sink.

The improvements relate to, first, a telescopic bearing to support and steady the upright shaft, which turns the digger or plow; second, means for supporting the plow in its extreme highest position by means of such telescopic bearing and a movable catch or slide; third, a peculiar construction of a gear-wheel and of its appurtenances by which the motion is communicated to the plow-shaft and the shaft steadied; fourth, a winged head and its adjuncts by which the plow is operated; fifth, filling-pieces to apply under the wings of the winged head and determine the extreme limit to which the plow may sink; sixth, a peculiar supporting-bracket and segment with worm for supporting and operating the steering-wheels; seventh, provisions by which breaking-pieces are introduced in a clutch, so as to be easily renewed; eighth, the combination of parts by which all the several functions of the machine are performed.

Referring to the figures, A is the boiler; A^1, a pair of rear wheels, which support and steer the structure. A^2 A^3 are the main or driving wheels. A^4 is a stout casing, which is firmly connected to the boiler by means of the stout framing or bracket piece A^5. A^6 are uprights, which hold the cylinder A^7. The latter contains a piston, fitting steam-tight, and provided with connections for raising and lowering the plow.

The rigid framing A^5, of cast-iron, formed as shown, connects all the fixed bearings to each other and to the boiler, or to a suitable rigid framing, (not shown,) extending lengthwise, after the manner common in locomotives.

T is the plow-shaft, and V the plow. The latter may be, as in my former patent, a partial-helical or screw-shaped device with sharp cutting-edges and smooth surfaces, adapted to easily work under and agitate the soil. I omit the teeth and the recesses therefor, which were described in my former patent as forming a part of the plow. Most or all of the further parts are different from the corresponding parts of my former patent.

Instead of providing a separate engine to drive the propelling mechanism, I drive it by a pitch-chain, D, from the same mechanism which rotates the plow-shaft. I use two cylinders and pistons, or, in other words, make a double engine for driving. Each cylinder is marked P, and its piston-rod *p*. They may be of different sizes, and constitute a compound engine; but I have not so represented them.

C is the shaft, C^1 the cranks, and C^2 a fly-wheel thereon. C^3 is a spur-gear wheel, which, by means of intermediate gearing, carries the pitch-chain D, and communicates the proper go-ahead motion to the driving-wheels A^2 A^3. There is a clutch, G, in the shaft, by which the wheels A^2 A^3 may be disconnected to facilitate turning.

The two cranks on the main shaft C have similar letters, C^1. The beveled gear-wheel on the same shaft is marked C^4. It gears into a wheel, X, which is peculiarly constructed and connected. It is formed with a long neck or bearing on the shaft T, both above and below. The neck below is marked X^1. The neck above is marked X^2. The part X^1 serves as an efficient bearing for the shaft, being directly supported on the exterior by the further annular piece Y, which is, in turn, directly supported on its exterior by the stout fixed casing A^4. The rim *y* of the part Y is raised, constituting the piece Y, a stout oil-cup or oil-well, in which the wheel X is amply lubricated, being supported by its bottom web, X^3, which travels smoothly around in the lubricating material. An inner rim, *y'*, of less height than the outer rim, *y*, tends to prevent the lubricating material from flowing too rapidly down the center. The entire bearing-piece, oil well, or cup Y is firmly held by screws, as represented.

The interior of the upper neck or long bearing, X^2, is grooved longitudinally, or splined along three lines, as plainly indicated in Fig. 7. These splines extend from the top down to and a little below the working or toothed portion of the wheel, as indicated in Fig. 4. Corresponding wings are forged or otherwise firmly fixed on the shaft T; but they are of less length, as indicated by T^1. These parts are so proportioned that when the plow is in its lowest or in any intermediate position the wings T^1 are engaged in the spline *x*, and receive the strong rotatory force of the wheel X; but when the plow-shaft T is raised to its extreme highest position a new condition is introduced, and the wings T^1 are entirely above and clear of the neck X^2, so that they may stand still while the wheel X, with its splined neck X^2, revolves idly below.

This is an important feature of the machine, and among other advantages allows me without further complication to throw the plow out of use, and to work the engine as rapidly as may be desired, either for propelling the machine or for any other use, as driving a thrashing-machine or any desired agricultural or other machinery.

Instead of holding the weight of the plow-shaft T and its attachments all the time by the fluid in the cylinder A^7, I can, as soon as the proper conditions are attained, allow it to rest by its wings T^1 on the bottom of the spline *x*. These are so proportioned as to allow the deepest plowing which will ever be required. When I desire to plow to a less depth temporarily, I can admit steam again to the cylinder A^7 and raise it. The same can be done in passing over any obstruction. When I desire to plow to a less depth permanently, I insert filling-pieces Z in the spline. I provide a number of sets of these filling-pieces Z, of different lengths, three of each length. On raising the plow-shaft and turning it a little, I can drop into the splines *x* the proper filling-pieces, and on again lowering the plow-shaft so that the wings T^1 engage in the splines the plow-shaft will only sink until the wings rest on the filling-pieces. The filling-pieces will then sustain the weight, and also resist the disposition of the plow and its attachments to work down deeper into the ground. Each filling-piece Z is formed at the top so that it may be seized by a proper tool to extract it when desired.

In the machine described in my said former patent, when the plow-shaft T is lowered and in active operation, there is an unsteadiness, due to its considerable distance from the supporting-bearing. E is a stout inclosing-sleeve, which, by being raised and lowered in the fixed support A^4, serves as a telescopic bearing. The shaft T is firmly surrounded and supported by the neck X^1 near its upper end and by the sleeve E at its lower end. I esteem it important to give a wide and efficient bearing-surface at and near the lower end of this sleeve, and also to fit closely for a considerable distance above to facilitate washing or cleaning, as will appear further on.

T^2 is a collar firmly keyed in the position represented a little above the mid-length of the shaft T. By its means the shaft T and its attachments may be supported upon the upper edge or rim of the sleeve E. The sleeve descends with the plow when the plow is lowered, and is compelled to rise with it when it is lifted. I interpose a cushion, of felt or other springy material, above the bottom E' of the sleeve E, as indicated by F. This softens the concussion when by any mismanagement the plow is allowed to strike violently at the termination of its lifting motion. I prevent the rotation of the sleeve E by a feather, H, introduced through a slot shown in Fig. 4.

I is a sliding pin or stop, adapted to match in a hole provided in the sleeve E when the latter is in its highest position. The slide I is controlled by a hand-lever, I^1, turning on a fixed center, *i*. It is acted on by a spring, I^2, which tends to hold the slide I always engaged.

When it is desired to lower the plow the engineer admits steam below the piston in the cylinder A^7, to take the weight of the plow and its connections, and then pulls the lever

I^1 sufficiently to withdraw the slide I, and on allowing the whole or a part of the steam to escape from the cylinder A^7 the plow with its attachments descends. The lever I^1 may now be liberated, and it will stand subject to the tension of the spring I^2, ready to engage and support the sleeve E and the plow-shaft and attachments whenever it shall be again lifted.

The bearing by which the piston-rod from the cylinder A^7 engages with the plow-shaft T is shown in Figs. 6 and 7. The plow-shaft is actively turning while the piston-rod and the nut at its lower end do not turn. I provide a series of smooth-faced washers, *j*, above the nut J^1, and equip the upper end of the shaft T, in which they are inclosed, with a strongly-keyed plug or head, T^3.

Before applying the piston-rod J into its seat in the head of the plow-shaft T, I firmly secure the nut J^1 by a cross-pin, J^2. What I esteem the best form of all these parts is shown in Figs. 5 and 6.

The upper end of the plow-shaft T is cup-shaped. This should be liberally supplied with oil.

In order to shed off the water which is liable to trickle down through the stuffing-box from the steam-cylinder A^7 above, I provide a shield, K, which is held in position by a pinching-screw, *k*, a little above, and, while it allows access for oiling by means of a suitable oiler, it sheds off any water which may trickle down the rod J.

When the sleeve E and its connections are lowered, much of its exterior surface is exposed to particles of loose earth which are thrown up by the plow. Proper lubrication with oil under such circumstances is difficult. I fit the parts as closely as may be, using leathers or other stuffing-boxes, if desired, to aid in making the joint tight, and, either alone or in addition to any ordinary devices for removing the dust when the sleeve is raised, provide a connection to the boiler through which steam or hot water is introduced at a high pressure, and caused to force its way down through the joint. A small annular channel, *a*, surrounds the sleeve E for this purpose considerably above its lower end. (See Fig. 4.) The steam or hot water is introduced to this channel through a pipe (not represented) connected to the orifice *a'*. The fluid is by this means introduced at a high pressure into the joint between the sleeve E and its inclosing-casing A^4, and flowing downward effectually washes away all foreign matter as the sleeve is lifted.

It will be readily understood that the proper motion is communicated to the driving-wheels A^2 A^3 through the pitch-chain D and sprocket-wheels R M by means of the spur-gear wheel *m*, turned by the latter, and engaging with gearing (not represented) formed in the interior of the driving-wheel A^2.

In commencing to operate I set the plow in rotation and let it gradually down to the proper depth before commencing to move forward. To facilitate this I provide a clutch by which the driving-wheels may be disconnected and again connected with facility. L is a bell-crank lever turning on a fixed center, *l*. It is connected by a rod, L', to a forked lever, N, turning on a fixed center, *n*. This lever engages with a movable ring, Q, which surrounds the fixed bearing A^9, and is free to revolve or to stand stationary. This ring Q carries two pins, *q*, which may be readily resupplied in case of fracture, and which extend through the sprocket-wheel R, which is mounted loosely on the stud A^{10}, which latter is socketed firmly in the part A^9, and supports the gear-wheel R'. The latter receives motion from the gear-wheel C^3, keyed on the main shaft C. The gear-wheel R' is formed with two long recesses in its side, as indicated by Fig. 10, adapted to receive the pins and allow them to become well entered before they strike. It follows that by turning the lever L the ring Q can be moved to the right or left, and consequently the pins *q* will be protruded into the wheel R' to engage the parts and induce the go-ahead motion, or will be withdrawn to disconnect the go-ahead motion at pleasure. The pins *q* are preferably made of good size and of brittle cast iron or steel. In case any insurmountable obstruction is interposed to the go-ahead motion, these pins will break, and by doing so save other and more important parts of the machinery.

The pulley C^2 on the end of the main shaft C is secured by a pinching-screw or other easily-operated means. When working as a plow, this serves to some extent as a fly-wheel. When operating for driving other machinery, as a portable engine, this wheel C^2 serves to communicate the power efficiently by an ordinary belt. (Not represented.)

I provide sets of change-gears to take the place of the gear-wheels R' and C^3. On removing the band-wheel C^2 from the shaft C, and the linchpin and washer from the end of the stud A^{10}, both the wheels R' and C^3 may be removed and others of different sizes properly matched may be supplied. I can thus readily attain the required variation in the relation of the go-ahead motion to the motion of the plow which is required in different soils.

For the steering I provide a worm and segment with a peculiar bracket to support the latter. The hand-wheel O operates a vertical shaft, which gears, as indicated, with the worm-shaft O', which extends horizontally fore and aft. A worm thereon engages with a segment, V', firmly keyed on the short upright shaft U. This shaft carries a series of smooth-faced washers, *u*, which bear upon a shoulder below, and receive the weight of the forward part of the machine through a stout bracket, A^{11}, which incloses and firmly supports the shaft U. It is connected to the boiler by one side only, leaving the other side entirely open, so that the segment U' may have the required range of motion.

Below the shoulder on which the washers *u*

rest the shaft U is forked, and supports a horizontal pin, *w*, which extends through the stout axis W of the rear wheels, A^1. I have represented these wheels as set a little unequally on their respective sides of the center, so that the one nearest the plow stands nearest the center; but this may not be essential. It is important that sufficient room be allowed for the axis W to tilt considerably without striking the worm O′ or any other part of the mechanism. It is also important to provide a sufficient space to allow the steering-wheels to swivel around enough to turn the machine within a short radius.

The washers *u*, being formed alternately of different metals, may support the load and allow the motions with sufficient freedom without very frequent lubrication.

Various modifications may be made in some of the details without departing entirely from the principle or sacrificing all the advantages of the invention. I propose, for example, where the expense will warrant it, to make the case A^4, which incloses the plow-shaft and its connections, not rigidly fixed, but so as to swing or turn forward or backward, or both, to a considerable angle. In such case the center of motion should be coincident with the axis of the main shaft C.

I propose in some cases to employ two or more of my plows, with suitable driving-gear, on a single machine.

I claim as my improvement in steam-plows—

1. The telescopic bearing E, in combination with the supporting-casing A^4 and the plow-shaft T, adapted for joint operation, as herein specified.

2. In combination with the plow-shaft T and telescopic bearing E, rising and sinking therewith, the slide I, mounted in the casing A^4, and engaging with the telescopic bearing to support it and its adjuncts when required, as specified.

3. In combination with the plow-shaft T and suitable driving means C^4, the gear-wheel X, having necks X^1 X^2, the lower neck, X^1, filling the interior of the casing A^4, and serving as a firm bearing for the shaft T, as herein specified.

4. The gear-wheel X X^1 X^2, formed with splines *x*, in combination with the plow-shaft T, having wings T′, and adapted to serve therewith, as and for the purposes specified.

5. The filling-pieces Z, in combination with the splined gear-wheel X X^1 X^2 and with the winged plow-shaft T T′, as specified.

6. The stout bracket A^{11}, having a wide lateral opening above and a complete tubular form below, in combination with the upright shaft U, segment U′, worm O′, and suitable supporting-wheels A^1, as herein specified.

7. The breaking-pins *q*, movable ring Q, and operating means L L′ N, in combination with the sprocket-wheel R and gear-wheel R′, serving relatively to each other and to the driving-wheels A^2 A^3 as herein specified.

8. The plow-shaft T and its connections, guiding means A^4, sleeve E, steam-raising means A^7, positive holding means I, and driving-wheel C^3 and its connections, in combination with each other and with the boiler A and suitable carrying-wheels A^1 A^2 A^3, as herein specified.

In testimony whereof I have hereunto set my hand this 31st day of August, 1878, in the presence of two subscribing witnesses.

JAMES FOGARTY.

Witnesses:
W. COLBORNE BROOKES,
CHAS. C. STETSON.