(No Model.)

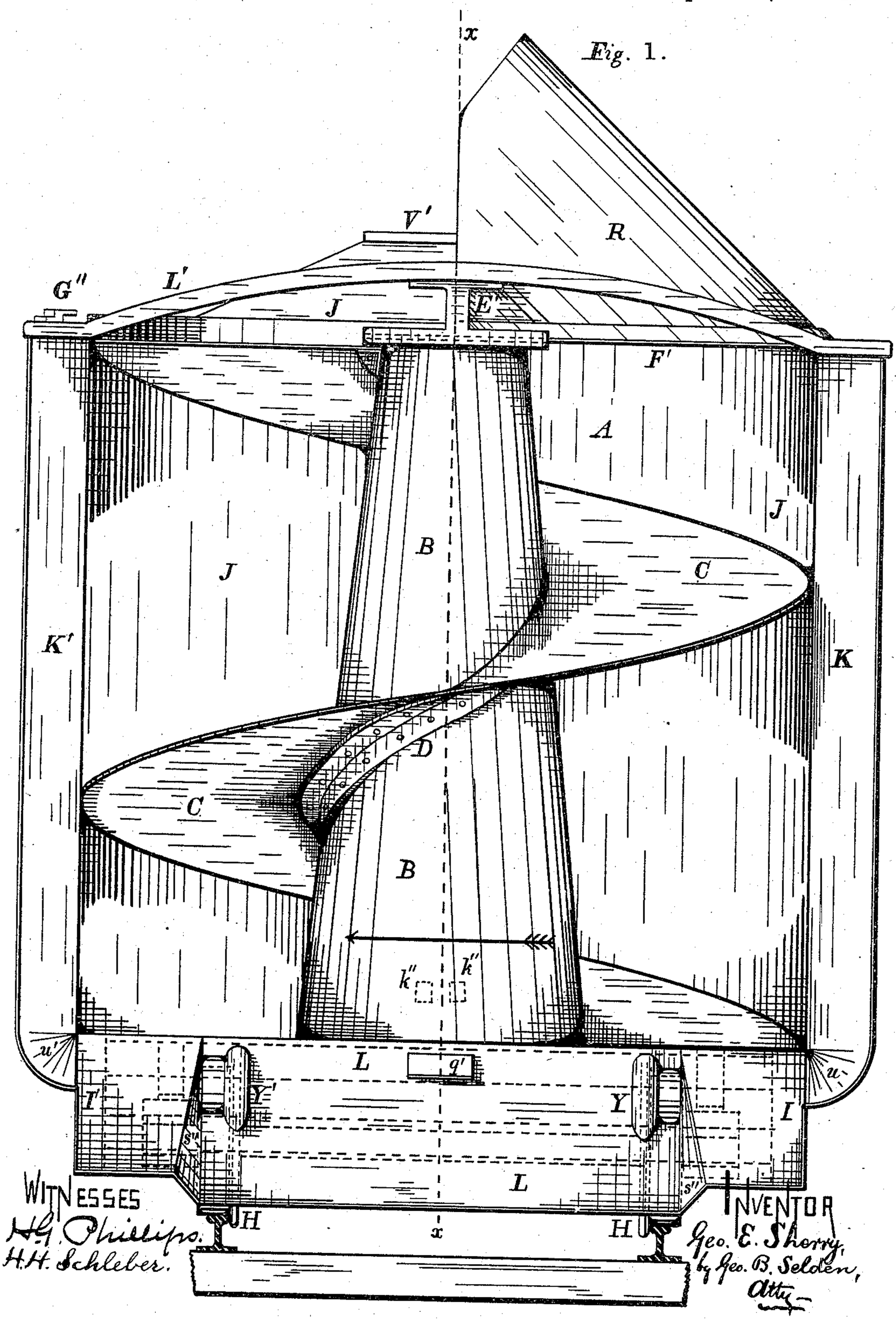
6 Sheets—Sheet 1.

G. E. SHERRY.

RAILWAY SNOW PLOW.

No. 305,717. Patented Sept. 23, 1884.

Fig. 1.



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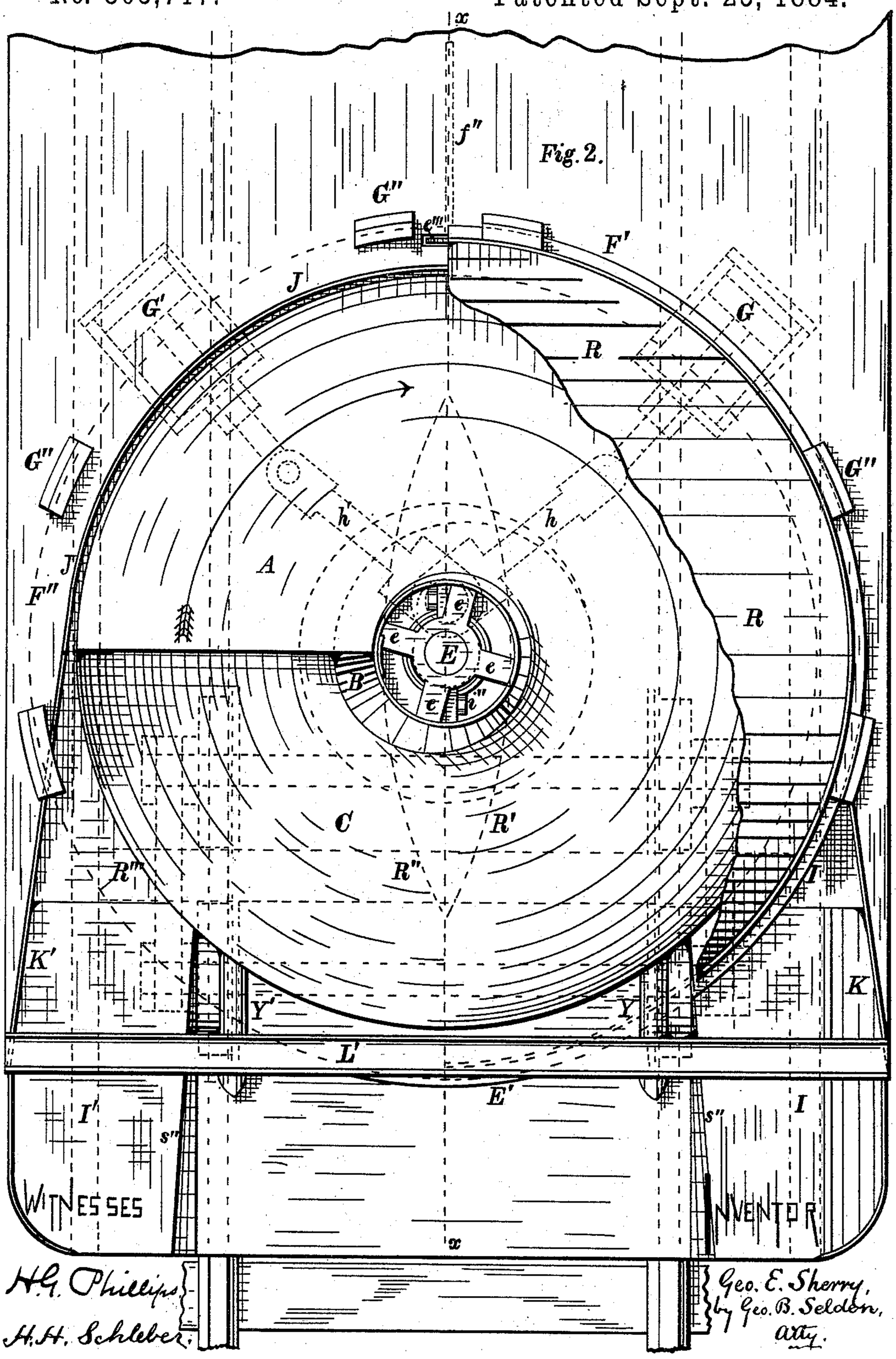
G. E. SHERRY.

RAILWAY SNOW PLOW.

No. 305,717. Patented Sept. 23, 1884.

Fig. 2.



H. G. Phillips.
H. H. Schleber.

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(No Model.) 6 Sheets—Sheet 3.

G. E. SHERRY.

RAILWAY SNOW PLOW.

No. 305,717. Patented Sept. 23, 1884.

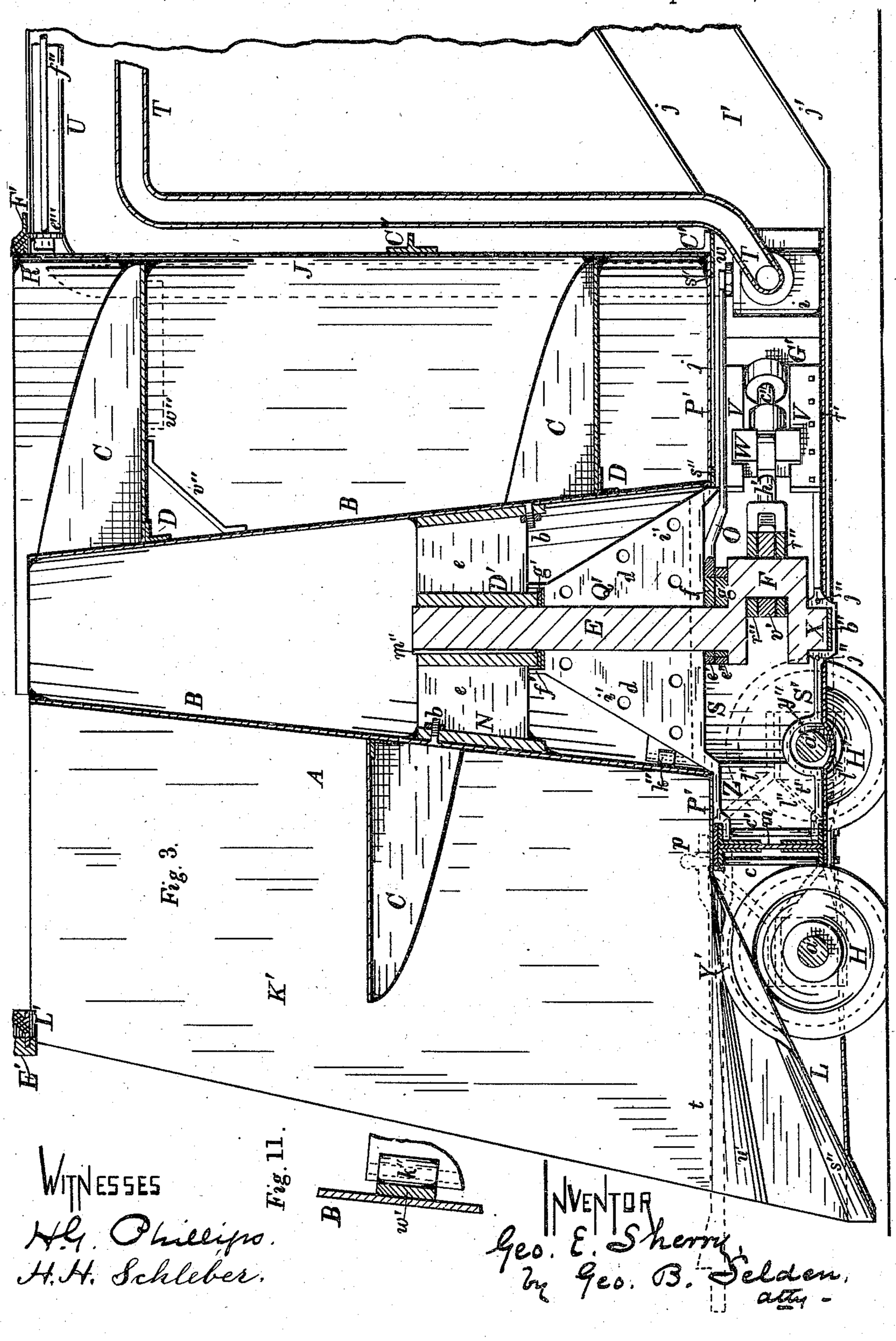

Fig. 3.

Fig. 11.

WITNESSES

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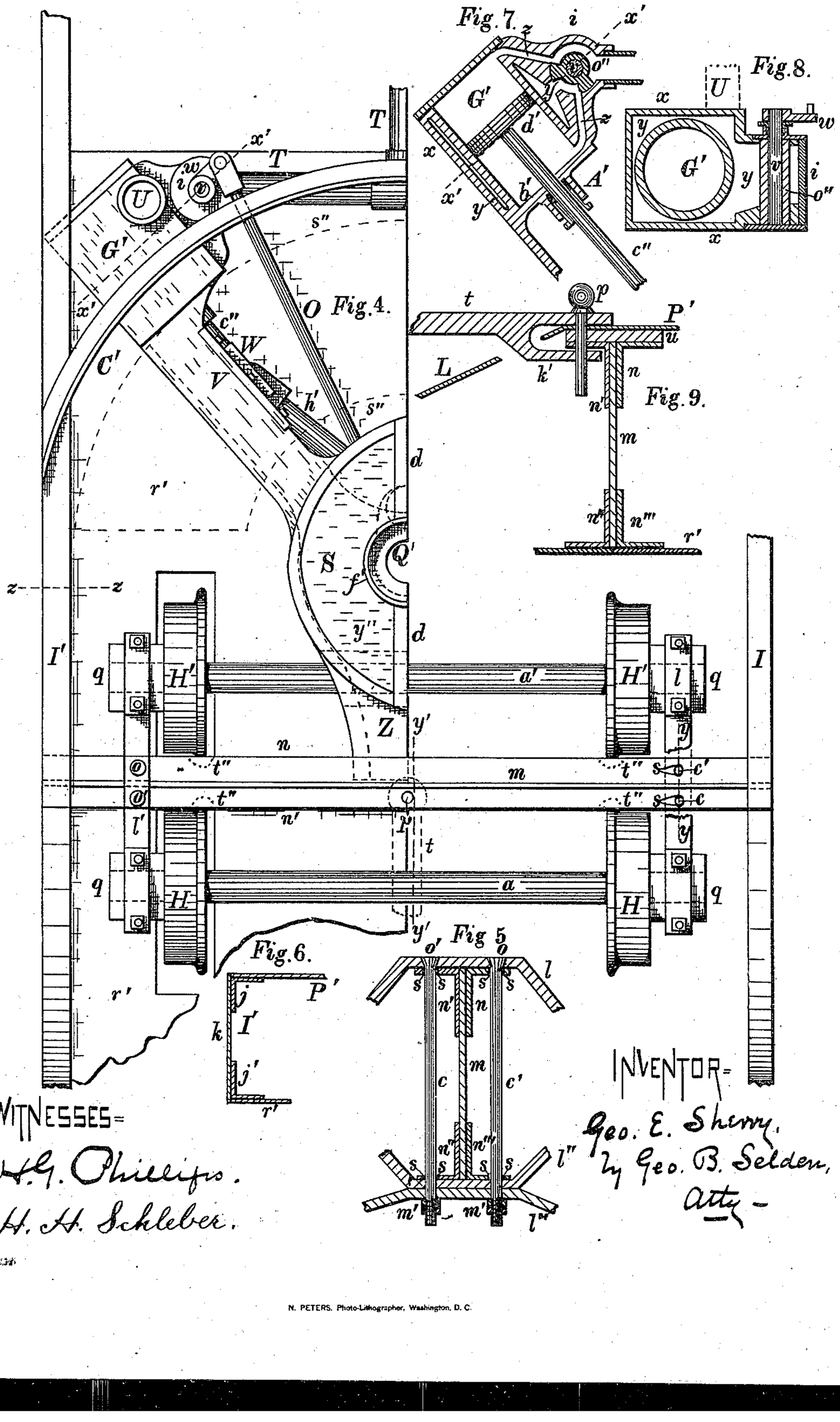
(No Model.) 6 Sheets—Sheet 4.

G. E. SHERRY.

RAILWAY SNOW PLOW.

No. 305,717. Patented Sept. 23, 1884.



WITNESSES=

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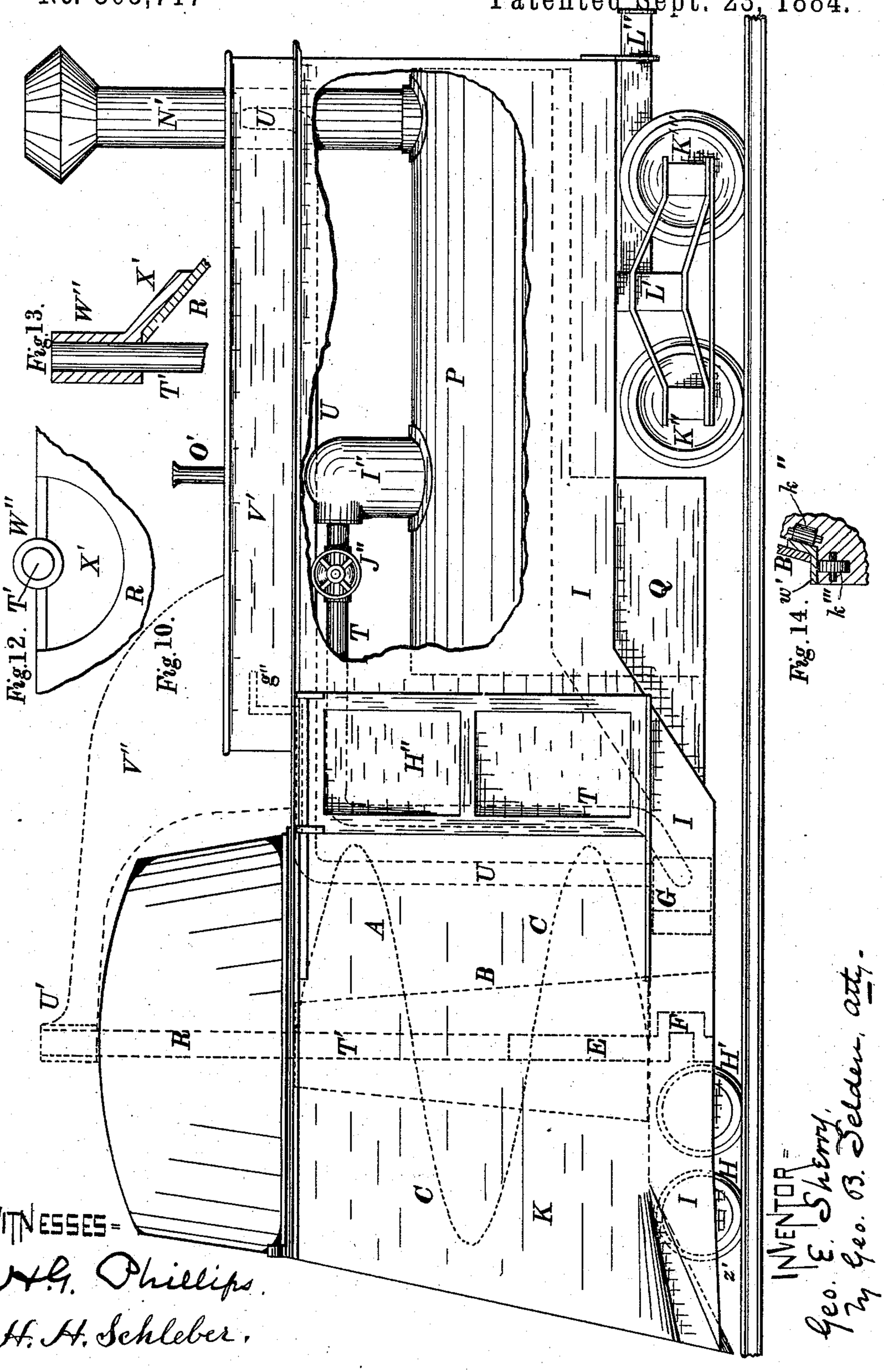
(No Model.)

6 Sheets—Sheets 5.

G. E. SHERRY.

RAILWAY SNOW PLOW.

No. 305,717 Patented Sept. 23, 1884.



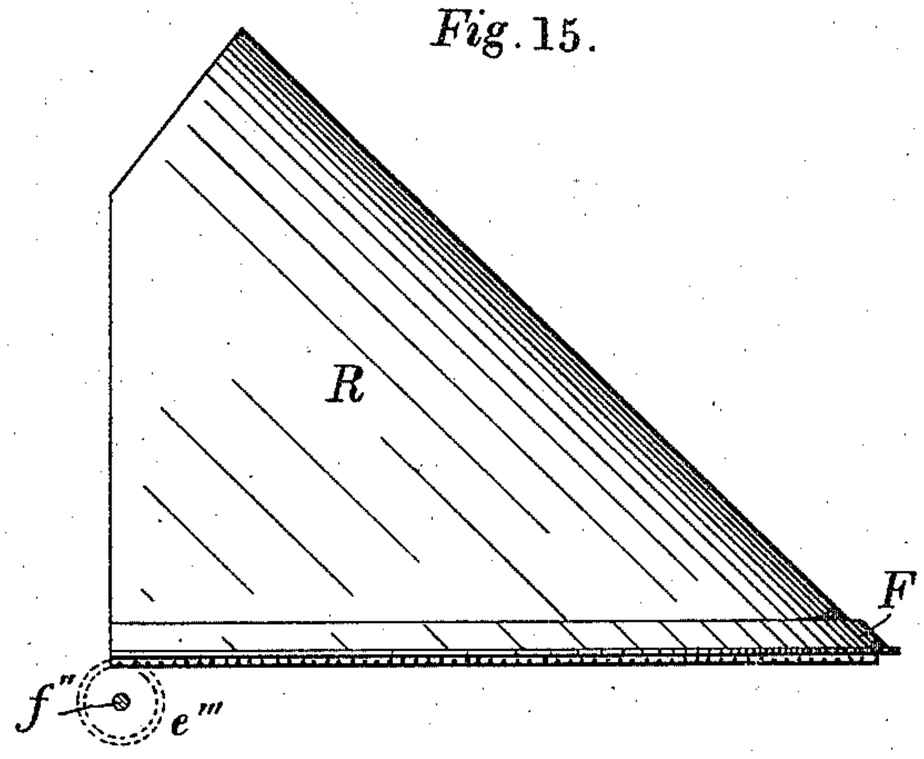
(No Model.) 6 Sheets—Sheet 6.

G. E. SHERRY.

RAILWAY SNOW PLOW.

No. 305,717. Patented Sept. 23, 1884.

Fig. 15.



WITNESSES=

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UNITED STATES PATENT OFFICE.

GEORGE E. SHERRY, OF ROCHESTER, NEW YORK, ASSIGNOR TO THE HAWLEY STEAM SNOW EXCAVATOR COMPANY, OF SAME PLACE.

RAILWAY SNOW-PLOW.

SPECIFICATION forming part of Letters Patent No. 305,717, dated September 23, 1884.

Application filed August 13, 1883. (No model.)

To all whom it may concern:

Be it known that I, GEORGE E. SHERRY, of Rochester, New York, have invented certain Improvements in Railway Snow-Plows, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to certain improvements in railway snow-plows, which improvements are fully described in the accompanying specification and drawings, and the novel features thereof specified in the claims attached to the said specification.

My improved railway snow-plow is represented in the accompanying drawings, in which Figure 1 is a front elevation. Fig. 2 is a plan view. Fig. 3 is a central longitudinal section on the line *x x*, Figs. 1 and 2. Fig. 4 is a plan view of the forward truck, showing also the steam-engine in half-plan. Fig. 5 is a partial longitudinal section through the truck-frame and cross-girder on the line *y y*, Fig. 4. Fig. 6 is a transverse section of one of the side frames on the line *z z*, Fig. 4. Fig. 7 is a horizontal section through one of the steam-cylinders. Fig. 8 is a transverse section of one of the steam-cylinders on the line *x' x'*, Fig. 4. Fig. 9 is a transverse section through the cross-girder on the line *y' y'*, Fig. 4, showing the mode of attaching the draw-bar. Fig. 10 is a side elevation of the whole machine. Fig. 11 represents one of the friction-rollers which support the cone of the elevating-screw. Figs. 12 and 13 are respectively plan and sectional views of the bearing attached to the deflector which supports the upper end of the screw-shaft. Fig. 14 represents a modification of the mode of arranging the friction-rollers under the elevating-screw. Fig. 15 is an elevation of the deflector, showing the toothed rack at its lower edge.

My improvements in railway snow-plows or steam snow-excavators for railroad-tracks are illustrated in the accompanying drawings, in which A represents the elevating-screw; B, the hollow cone; E, the shaft of the screw; F, the crank; G G', the steam-cylinders; H H', the wheels of the front truck; I I', the side frames; J, the circular casing behind the screw; K K', the wings; L, the inclined plane; K'' K''' L', the rear truck; P, the steam-generator; Q, the fire-box of the same, and R the movable deflector for delivering the snow to either side of the track.

The general construction and arrangement of my improved snow-plow in the form in which it is preferably built will be understood from an inspection of the side elevation, Fig. 10. It consists of a suitable body, resembling in some respects an ordinary box-car, supported on truck-wheels H H' K'' K''', so as to be capable of traveling on a railway-track, and provided at its forward end with the rotating elevating-screw A, driven by a steam-engine located at the bottom of the screw and supplied with steam from the boiler P. The whole structure is preferably made of metal in order to secure the requsite strength. The side frames, I I', which consist of a heavy plate, *k*, Fig. 6, to the upper and lower edges of which are riveted the flange-plates *j j'*, extend the whole length of the body, and are connected together at the front end by the cross-girder *m*, between the two pairs of wheels of the forward truck and behind the steam-cylinders G G', by cross-girders suitably located and arranged to sustain the steam-boiler P.

As shown in the side elevation, the side frames, I I', may be bent or offset near the middle of the body, so as to bring them above the bolster L' of the rear truck, K'' K''', which may be of any ordinary or preferred construction. At their forward ends the side frames are pointed or beveled downward, so as to afford support for the inclined plane L, up which the snow is forced by the forward movement of the plow. The side plates inclosing or forming the body of the plow, and the wings K K' at the sides of the elevating-screw, are riveted to the side frames, I I', suitable doors, H'', Fig. 10, being provided through which to obtain access to the engineer's room, between the elevating-screw and the boiler. The roof in rear of the elevating-screw may be inclined in each direction from the center, as represented at V', but a flat passage-way should be provided along it, so that train-men can pass over the plow when forming a part of a freight-train, in which case a suitable platform is placed over the top of the screw at one side of the deflector R.

The roof, sides, and end of the plow may be strengthened by angle-beams at the corners or

other locations in any preferred manner, the whole structure being suitably secured together by rivets or bolts. A door may be placed in the end of the plow. The rear end of the plow is provided with an ordinary draw-head, L″, and at its forward end the plow is provided with the draw-bar *t*, Fig. 3, the manner of connecting which with the front cross-girder by the pin *p* is represented in the sectional view Fig. 9. In this way provision is made for pushing the plow when in use over the road by a locomotive attached behind, or for drawing it over the road as part of a train.

The draw-bar *t* is bifurcated at its rear end, the lower part, *k*′, Fig. 9, being arranged to pass through the inclined plane L in an opening, which is closed by a cap or plate, *q*′, Fig. 1, when the plow is in use.

The boiler P is supplied with water by an injector from a tank located on one side of or a horseshoe tank above the boiler, arranged in the manner adopted in the construction of some tank-locomotives. Coal-bunkers may also be provided on one side of the boiler.

In order to permit the requisite swiveling motion of the forward trucks, I attach them to the cross-girder *m* by the rods *c c*′, extending between the upper and lower truck-frames and passing through slotted holes *s s*, Figs. 4 and 5, in the horizontal parts or flanges of the cross-girder.

The girder consists of one or more vertical plates, *m*, Figs. 4 and 5, arranged transversely, provided with flanges or angle-beams *n n*′ *n*″ *n*‴, and fastened to the side frames, I I′, in any suitable manner.

The axles *a a*′ of the forward truck-wheels H H′ are provided with the usual journal-boxes, *q*, Fig. 4, on each side outside the wheels, which boxes are connected together by a suitable truck-frame, which may consist of the bars *l l*″ *l*‴, bent so as to pass above and below the cross-girder *m*. The bolts *c c*′ pass vertically through the truck-frame, being countersunk into it at their upper ends, as represented at *o o*′, and provided at their lower ends with the nuts *m*′ *m*′, Fig. 5. Where the bolts pass through the horizontal parts of the cross-girder the holes are slotted lengthwise of the machine, as represented at *s s*, in order to permit of the requisite swiveling motion in the truck in passing around curves or over inequalities in the track. As the wheel-base of the trucks is short, but a small amount of movement in the slotted holes is necessary. A single bolt, *c*, might be used at each end of the truck, and the cross-girder may be made with two vertical plates attached together in any suitable way with the bolt passing between them. The horizontal plates may be strengthened or thickened about the slotted holes in any suitable way. The bolts need not be countersunk in the upper part of the truck-frame when the construction is varied from that herein shown, so as to bring the plate P′, constituting the bottom of the inclosure, containing the elevating-screw, far enough above the top of the cross-girder to permit of the use of bolt-heads of the ordinary form. Between the truck-frames the plate P′ rests on a suitable blocking or support on the cross-girder, as represented at *u*, Fig. 9. The lower flanges, *n*″ *n*‴, of the cross-girder may be notched, as represented at *t*″, Fig. 4, to receive the flanges of the truck-wheels and to permit their motion when the truck swivels.

As represented in the drawings, the single elevating-screw is made of dimensions sufficient to remove the snow from the whole width of the track. In order to obtain room for the bearings or frame-work necessary to support a screw of such dimensions, it is constructed with a hollow center, B, either cylindrical or conical, the latter being preferred as affording increased space for the discharge of the snow at the upper end. The cone B consists of sheet metal rolled into the conical form, and secured together by bolts or rivets. The flange C of the screw is also preferably formed of sheet metal bent into the proper shape, and secured to the exterior of the cone by the bent angle-plate D, which is riveted or bolted to both the flange and the cone.

The flange of the screw may make any preferred number of turns about the cone, according to the judgment of the constructor and the speed at which he designs to run the engine by which the screw is driven; but I have found in practice that a pitch or lead of one turn in six feet performs satisfactorily.

The cone and its flanges may be cast in whole or in sections; but I prefer to make it of sheet metal, as herein shown, as possessing the greatest strength for the least weight. If desired, the flange may be supported from the cone by suitable angular braces, as represented at *v*″, Fig. 3. Provision may also be made for balancing the screw by the attachment to the under side of the flange C of suitable weights, as represented by the dotted lines *w*″, Fig. 3.

The cone and its flange, constituting the elevating-screw, are supported on the shaft E by the conical casting or wheel N, Fig. 3, which consists of an outer web, to which the cone is secured by bolts or rivets *b b*, suitable arms, *e e*, and a hub, D′, keyed or otherwise fastened to the upper end of the shaft. The shaft revolves in a bearing, Q′, formed in the frame-work of the steam-engine which drives the screw, its lower end being stepped at X in a suitable bearing also formed in the frame.

The engine is provided with two double-acting cylinders, G G′, arranged at an angle with each other, as represented in Figs. 2 and 4, and directly connected with the crank F on the shaft E by means of the piston-rods *c*″ and connections *h h*′. Each cylinder is preferably formed in one piece with its frame-work, including the half of the bearing Q′, as represented in the drawings in Fig. 4. The cylin-

der is jacketed, as at *y*, Fig. 8, the outer casing, *x*, of the jacket being made square, so that its outer corner may be fitted between the angle-beams *j* and *j'* of the side frame, I'. The cylinders are also attached together by the curved angle-beam C', which passes around the outside of the casing J, in rear of the elevating-screw, being bolted to this beam. The inner cylinder-head may also be cast with the cylinder and frame-work. The guides V V are bolted to the frame in the proper position to receive the cross-head W, and the connections *h h'* are forked over each other, as indicated at *v' v''* in Fig. 3, and provided with suitable bearings fitted to the crank F. The eccentrics *f g* are fastened on the crank-shaft immediately above the crank and below the central plate, S, of the engine frame-work, being provided with eccentric-straps *e' e''*, connecting with eccentric-rods which operate the valves of each cylinder, one of which is shown at O, Figs. 3 and 4.

In the drawings I have represented a rocking valve, *o''*, Fig. 7, in the valve-casing *i*, attached to the valve-stem *v*, and operated by the arm *w*, jointed to the end of the eccentric-rod; but any other form of valve may be employed.

z z are the inlet-ports, and the exhaust-port opens into the jacket *y*.

Steam is admitted to the cylinders from the boiler P through the steam-supply pipe T, provided with the throttle-valve J'', and the exhaust takes place through the pipe or pipes U, which may be led into the smoke-stack N', and provided with an exhaust-nozzle to increase the draft in the boiler P.

The half-frames of each steam-cylinder are connected together by bolts *i''*, Fig. 2, passing through the holes *i'*, Fig. 3, in the flanges *d*, which arise from the plates S. Below the crank the frames are fastened together by the bolts *j'' j''*, Fig. 3, the lower part, S', of the frame-work being extended forward and curved over the rear axle of the front truck, as represented at *y''*, Fig. 3, and attached to the lower part of the cross-girder *m*.

The engine frame-work is made of such a form as to permit the rotation of the crank and the vibration of the connections, the sides of the frame which connect the upper and lower plates, S and S', being curved outward, as indicated by the dotted lines in Fig. 4, for this purpose. Below the engine is placed the sheet-metal plate *r'*, which is fastened to the lower part of the side frames, I I', and extends entirely across the machine, suitable openings being formed in it, through which the truck-wheels H' H' project. That portion of the plate which comes below the recess in the frame, through which the axle *a'* passes, may be made independently removable, for the purpose of allowing the truck-wheels to be changed in case the same should become necessary. A similar plate, *r'*, Fig. 4, may be attached to the side frames in front of the forward truck-wheels. The bearing Q', in which the crank-shaft turns, may be made of any suitable length, as the judgment of the constructor shall dictate, and the bottom of the cone may be arranged to be sustained under heavy strain by one or more friction-rollers, *k''*, Figs. 1, 3, and 11, carried by suitable brackets attached to the plate S of the engine-frame or to the flanges *d d*.

In Fig. 11, which is a vertical section, I have represented the cone as provided on its interior with the turned ring *w'*, which runs against the friction-roller *k''*. The friction-rollers may also be placed at the rear or sides of the cone, to resist undue pressure in any direction. The weight of the elevating-screw may be supported on the friction-collars *g'*, arranged within an oil-cup, *f'*, between the hub of the wheel N and the upper part of the bearing on the engine-frame. A friction-plate, *b''*, may also be placed at the lower end of the crank-shaft F. The inclined plane L is arranged in front of the screw, being formed of a sheet-metal plate extending across between the side frames, and stiffened, if necessary, by suitable ribs or angle-beams.

As represented in the drawings, the inclined plane is bent or curved upward at Y Y', in order to accommodate the upper portions of the front truck-wheels, H H, which revolve in the recess thus formed.

It will be observed that the outer part of the flange C of the elevating-screw projects some distance beyond the top of the inclined plane—an arrangement which has the important result of materially reducing the power necessary to push the plow forward and to force the snow in front of it up the incline as the snow is continually removed from the upper part of the inclined plane by the revolution of the screw. Immediately outside the rails the inclined plane is bent upward lengthwise of the machine, as indicated at *s''* in the drawings, which construction stiffens the plate and prevents the removal of unnecessary snow. Outside of these offsets *s''* the edge of the inclined plane is farther above the level of the track than it is between them, and the inclination is thereby reduced. Immediately behind the screw is placed the semicircular casing J, which may be stiffened by the curved angle-beams C' C''. At its forward sides it is attached to the wings K K', which are inclined outward slightly, so that its edges are at a distance apart equal to or slightly greater than the width of the widest cars used on the railway for which the plow is designed. It is unnecessary that these wings should extend downward of their full width to the edge of the inclined plane, and I therefore bend them inward a short distance above this point, as indicated at *u u'* in the drawings. The wings are also stiffened toward the bottom by this arrangement. The forward edges of the wings may also be stiffened by plates riveted to them and by suitable horizontal

a -beams tapering toward their forward ends riveted to the outside of the wings. The upper front parts of the wings are connected together by the brace L′, which may, if preferred, be given an arched form, as represented in the drawings.

In order to afford access to the engines, I make the plate P′ in rear of the bottom of the cone removable. This plate rests on and is bolted to suitable projecting ledges. (Shown at *s″*, Fig. 3, and indicated by the dotted lines *s″* in Fig. 4.) The form of the opening through the plate *s″* is not material, but access to the engines for repairs should be afforded through the bottom casing, below the screw, although ordinary repairs may be effected from the engineer's room between the cylinders, the steam-pipes being arranged to permit this operation.

Above the elevating-screw is placed the deflector R, which consists of an inclined plate, suitably stiffened, if need be, arranged so as to cause the snow thrown upward by the revolution of the screw to be turned sidewise and delivered at one side of the track. The deflector may be plane or curved, having a conical or cylindrical form, and it should be so arranged that it may be moved or adjusted to deliver the snow at either side of the track at will. The deflector may project either entirely or partially across the top of the screw. I prefer to construct it of a cylindrical or nearly cylindrical form, as represented in the drawings, and I have found in practice that it need not project more than half-way across the top of the screw. It is provided at its lower edge with angle-plates F′, which stiffen it, and the flanges of which project under suitable clips or gibs, G″ G″, by which it is held in place while being rotated from one side of the machine to the other, as indicated by the full and dotted lines R R′ R″ R‴ F′ F″, Fig. 2. The clips G″ are attached to the roof of the plow, and may be either continuous or separate, as shown. In order to support the forward part of the deflector, a bracket, E′, provided with a groove adapted to receive the flange of the angle-plate F′, may be attached to the brace L′. A curved rack is attached to the edge of the deflector or to the angle-plate F′, or cut thereon, which engages with the pinion *e‴*, Figs. 2 and 3, on the shaft *f″*, so that the engineer of the plow, by turning the crank *g″*, Fig. 10, can rotate the deflector and cause the delivery of the snow to either side of the track, as circumstances may require. The shaft *f″* is arranged to rotate in suitable bearings attached to the roof of the car, so as to bring the crank *g″* conveniently within the control of the engineer. Any other suitable means may, however, be employed for revolving the deflector—such, for instance, as a worm and worm-gear.

In the construction of elevating-screws of great height it may be desirable to extend the shaft E up above the top of the screw, (see dotted lines T′, Fig. 10,) and to support it by a suitable bearing, U′, at its upper end, carried by an arm, V″, of sufficient strength attached to the upper portion of the frame-work of the plow. This arm should be broad laterally, so as to be sufficiently stiff. The bearing for the upper end, T′, of the screw-shaft may also be carried by the deflector, as represented in Figs. 12 and 13, in which the shaft T′ is shown as fitted in the bearing W″, attached to the deflector by the flange X′.

The engine which drives the elevating-screw may be supplied with steam from the locomotive which is used to push the plow through a flexible or suitably-jointed pipe; but I prefer to use an independent boiler, as herein shown.

Any suitable scraper or flanging device may be used in connection with my improved snow-plow, being preferably placed at *z′*, Fig. 10, in front of the forward trucks, for the purpose of cleaning the rails and flange-grooves from snow.

The recesses Y Y′ in the inclined plane for the reception of the forward truck-wheels may be formed by bending or forging the plate constituting the inclined plane, or they may be suitably-shaped caps or covers attached to the plate.

In the sectional view Fig. 14 I have represented a friction-roller, *k‴*, as applied directly to support the weight of the elevating-screw and cone. In this case the ring *w′* may be provided with a horizontal flange, which rests on the roller *k‴*.

Various modifications may be made in the construction of my improved snow-plow without material departure from the principle involved in my invention. Thus the wings K K′ may be made shorter than as shown in the accompanying drawings, the relative proportions between the dimensions of the screw and the other parts may be varied, the method of constructing the forward trucks may be changed, the deflector may be arranged to be adjusted from one side to the other in other ways than as herein described, and the steam-engine may be built on any other plan, and a vertical or other steam-generator may be employed. I have, however, endeavored to illustrate my invention herein in the form in which I prefer to build it, and in which it has proved itself highly efficient in practical use.

I do not intend to confine my invention to the particular form of steam-engine herein shown, as the elevating-screw may be driven by any other kind of steam-engine directly connected to the screw-shaft at the base, as the judgment or experience of the constructor may indicate. The advantage, however, which arises from the use of a single crank and angularly-disposed cylinders is, that the utmost compactness is obtained, sufficient room being secured for the necessary machinery, while the base of the elevating-screw is placed as low down as the size of the forward truck-wheels will permit, and the height of

the inclined plane is reduced as much as possible. By the employment of two quartering cranks the cylinders may be brought in line with each other, the inclined plane being increased in length and height to afford sufficient room for the machinery. Neither do I intend to confine myself to the particular means herein shown for permitting the swiveling motion of the forward trucks, as any other mode of accomplishing this result may be employed.

Instead of forming the bearing Q′ for the screw-shaft in the divided frame-work of the engine, any other suitable construction permitting of the taking up of wear in the journal may be employed.

I hereby disclaim anything shown or described in the patent of Hawley, No. 218,815, August 26, 1879.

I hereby reserve to myself the right to make any patentable features herein described and not herein claimed the subject of a separate application.

I am aware that it has been heretofore proposed to discharge the snow from snow-plows by means of a revolving fan, as shown—for instance, in the patent of Tierney, No. 87,989, March 16, 1869—and such device I do not claim.

I claim—

1. The combination, with a snow-plow, of an elevating-screw arranged to revolve within a suitable casing, and driven by a steam-engine located beneath the lower end of the screw, substantially as described.

2. The combination, with the inclined plane L, of the elevating-screw A, attached to crank-shaft E, having a steam-engine connected thereto, substantially as described.

3. The combination, in a snow-plow, of an elevating-screw arranged to revolve within a suitable casing, and driven by a steam-engine located beneath the lower end of the screw, and an inclined plane adapted to raise the snow to the lower end of the elevating-screw, substantially as and for the purposes set forth.

4. The combination, with the elevating-screw A, having a steam-engine connected thereto at its base, of the deflector R, substantially as described.

5. The combination, with the inclined plane L, of the elevating-screw A, casing J, wings K K′, and deflector R, substantially as described.

6. In a railway snow-plow, a vertical revolving snow-elevating screw having a diameter greater than the width of the rails, arranged within a suitable casing adapted to confine the snow at its bottom, rear, and sides, but open at the top of the screw and on the front side for the whole height thereof, in combination with the wings K K′, having offsets *u u′*, and the inclined plane L, bent upward at *s″ s″*, substantially as and for the purposes set forth.

7. In a railway snow-plow, a vertical revolving snow-elevating screw having a diameter greater than the width of the rails, arranged within a suitable casing adapted to confine the snow at its bottom, rear, and sides, but open at the top of the screw and on the front side for the whole height thereof, in combination with an inclined plane, L, for raising the snow to the elevating-screw, bent upward at *s″ s″*, and the frames I I′, substantially as and for the purposes set forth.

8. In a railway snow-plow, a vertical revolving elevating-screw having a diameter greater than the width of the rails, arranged within a suitable casing adapted to confine the snow at its bottom, rear, and sides, but open at the top of the screw and on the front side for the whole height thereof, in combination with an inclined deflector above the screw, operating to deflect the snow laterally, substantially as and for the purposes set forth.

9. The combination, with a single elevating-screw of dimensions sufficient to clear the whole width of the track, of a movable snow-deflector arranged above the screw and operating to deflect the snow thrown against it by the screw to either side, substantially as described.

10. The combination, with the elevating-screw A, of the inclined plane L, having the upwardly-bent offsets *s″ s″*, substantially as described.

11. The combination, with the inclined plane L, provided with recesses Y Y′ for the truck-wheels, of the elevating-screw A, substantially as described.

12. The combination, in an organized structure adapted for the removal of snow from railways provided with swiveling trucks, of the elevating-screw A, inclined plane L, and a steam-engine connected with the screw at its base, substantially as described.

13. The combination, with the elevating-screw A, of the deflector R, arranged to revolve in suitable guides or ways, G″, substantially as described.

14. The combination, with the elevating-screw A, of the deflector R, guides or ways G″, and suitable mechanism for shifting the deflector from one side to the other, substantially as described.

15. The combination, with the inclined plane L, of the elevating-screw A, arranged to be driven by a steam-engine at its base, and the swiveling trucks H H′, substantially as described.

16. The combination, with the hollow center or cone B, provided with spiral flange C, of the crank-shaft E and wheel N, substantially as described.

17. The combination, with the elevating-screw A, of the crank-shaft E, steam-engines G G′, connected together by the divided frame-work forming a bearing for the crank-shaft, substantially as described.

18. The combination, with the elevating-screw A, consisting of a hollow center provided with spiral flange, of the wheel N, shaft

E, and bearing Q′, within the lower part of the hollow center, substantially as described.

19. The combination, with the elevating-screw A, consisting of a hollow center provided with a spiral flange and supported on the shaft E in a bearing within the cone, of one or more friction-rollers, substantially as described.

20. The combination, with the elevating-screw A, operated by a steam-engine located at its base, of the inclined plane L, side frames, I I′, cross-girder *m*, and swiveling trucks H H′, substantially as described.

21. The combination, with the elevating-screw A, operated by a steam-engine located at its base, of the inclined plane L, side frames, I I′, cross-girder *m*, swiveling trucks H H′, truck-frames *l l′*, and bolts *c c*, substantially as described.

22. The combination, with the elevating-screw A, of the casing J, inclined plane L, and inclined wings K K′, bent inward at *u u′*, substantially as and for the purposes set forth.

23. The combination, with a snow-plow consisting of the inclined plane L, elevating-screw A, casing J, and wings K K′, of the draw-bar *t*, whereby the plow may be coupled to a train at its forward end, substantially as described.

24. The combination and arrangement, in a single structure adapted to travel on railways, of an elevating-screw having a steam-engine connected thereto at its base, an inclined plane for raising the snow to the elevating-screw, and a steam-generator supplying steam to the engine, substantially as and for the purposes set forth.

25. The combination and arrangement in a single structure adapted to travel on railways, of an elevating-screw having a steam-engine connected thereto at its base, an inclined plane for raising the snow to the elevating-screw, a deflector above the screw for delivering the snow laterally, and a steam-generator supplying steam to the engine, substantially as and for the purposes set forth.

26. The combination, with the elevating-screw A, having a steam-engine directly connected thereto at its base, of the removable plate P′, at the bottom of the screw-inclosing casing, substantially as described.

27. The combination, with the elevating-screw A, supported on crank-shaft E, of the angularly-arranged steam-cylinders G G′, and suitable connections with the crank F and valve-operating mechanism, substantially as described.

28. The combination, with a snow-plow, of the elevating-screw A, consisting of tapering center or cone B, smallest at its upper end, having the spiral flange C, and arranged to rotate within a suitable casing, substantially as and for the purposes set forth.

29. The combination, in a railway snow-plow, of the elevating-screw A, having a steam-engine directly connected thereto at its base, the inclined plane L, the swiveling trucks H H′, and side frames, I I′, arranged outside of the truck-frames and extending forward to support the inclined plane, substantially as and for the purposes set forth.

30. The combination, in a railway snow-plow, of the inclined plane L, the elevating-screw A, supported on a suitable crank-shaft, and a steam-engine connected to the said crank-shaft, provided with bearings therefor above and below the crank, substantially as and for the purposes set forth.

31. The combination, in a railway snow-plow, of the elevating-screw A, inclined plane L, the snow-deflector R, and a bearing for the screw-shaft, located above the deflector, substantially as and for the purposes described.

32. The elevating-screw A, consisting of a hollow center, B, provided with spiral flange C, supported by the angular braces *v″*, substantially as described.

33. The combination, in a railway snow-plow, of the elevating-screw A, having a steam-engine directly connected thereto at its base, the side frames, I I′, a suitable cross-girder, *m*, swiveling trucks H H′, and the engine-frame attached to the cross-girder and arranged to permit the swiveling movement of the trucks, substantially as described.

GEORGE E. SHERRY.

Witnesses:
DE WITT HAWLEY,
GEO. B. SELDEN.