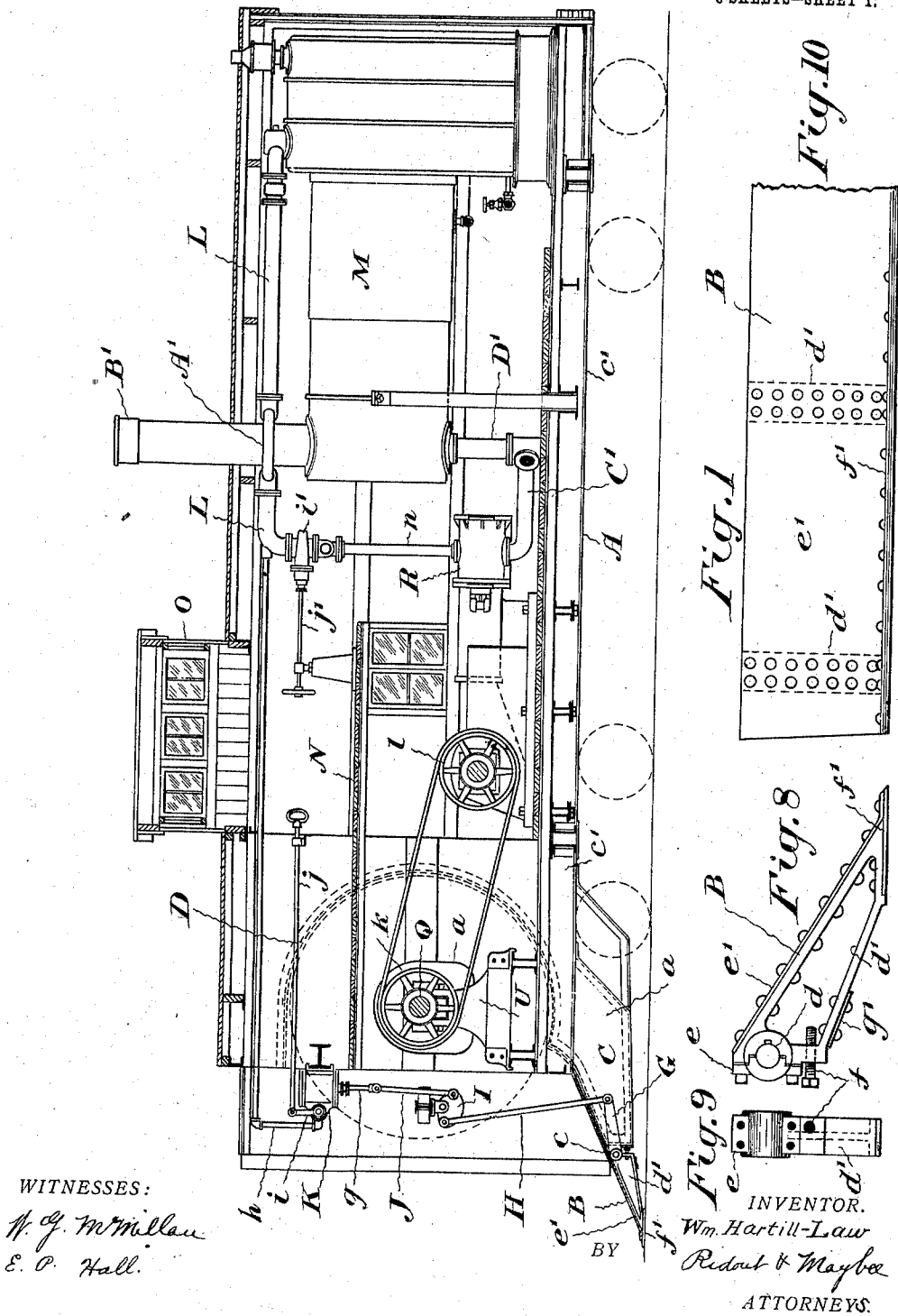


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APPLICATION FILED FEB. 14, 1910.

966,831.

Patented Aug. 9, 1910.

3 SHEETS—SHEET 1.

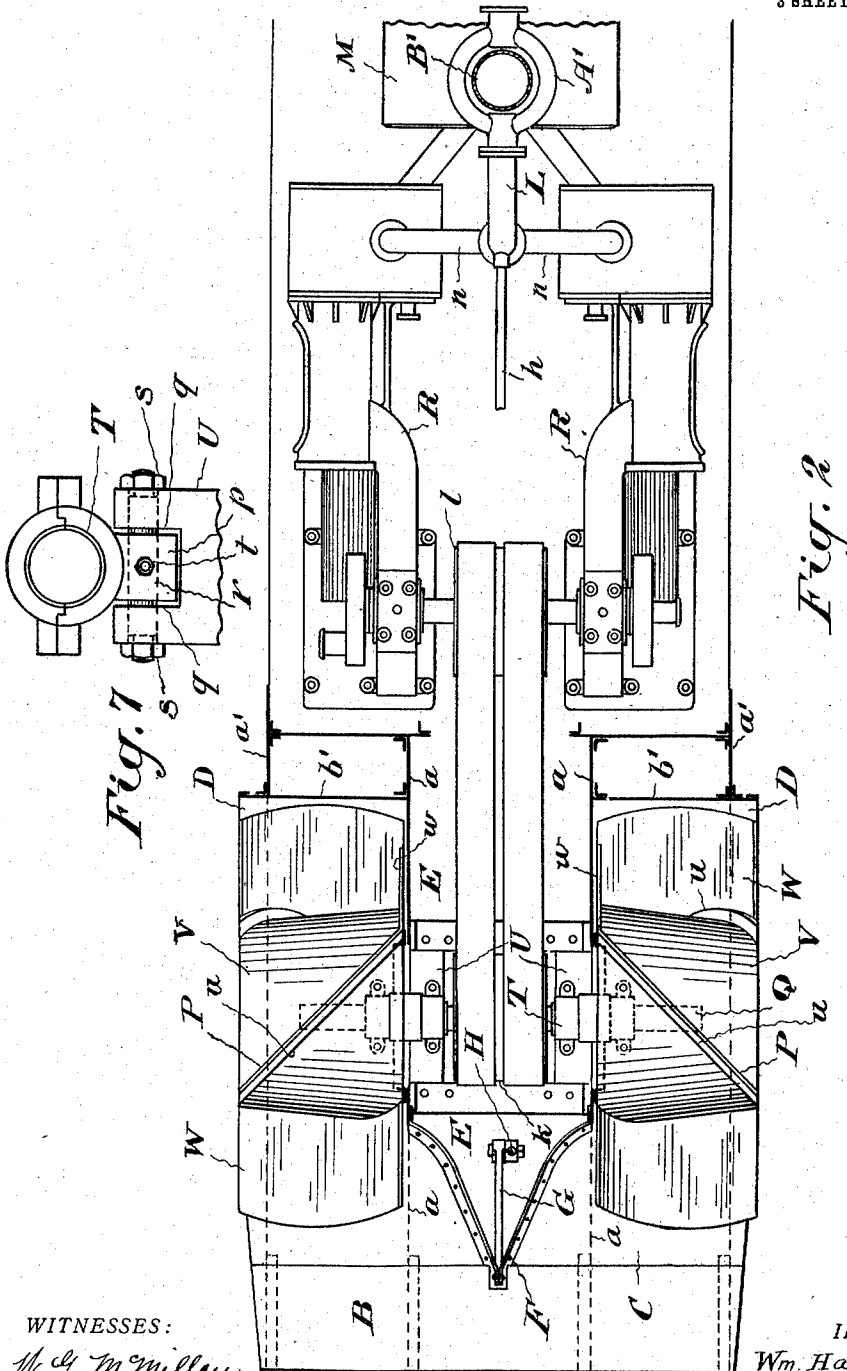


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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

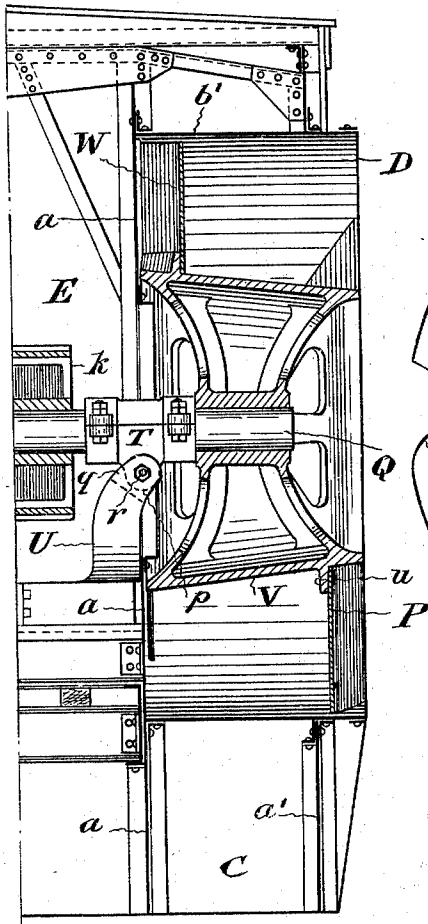


Fig. 3

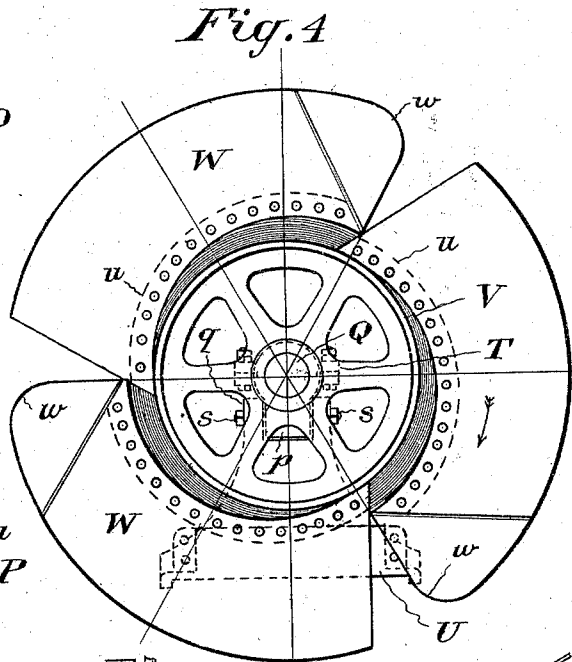


Fig. 4

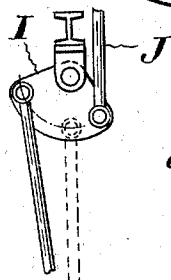


Fig. 6

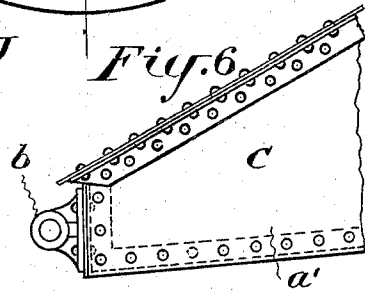
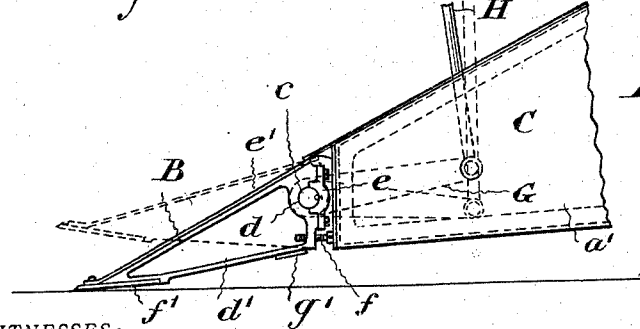


Fig. 5



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SNOW-PLOW.

966,831.

Specification of Letters Patent.

Patented Aug. 9, 1910.

Application filed February 14, 1910. Serial No. 543,796.

To all whom it may concern:

Be it known that I, WILLIAM HARTILL-LAW, of the city of Toronto, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Snow-Plows, of which the following is a specification.

This invention relates to snow plows of the type in which the front or operative end is provided with a horizontal shovel, a vertical prow and expellers which throw out the snow lifted and divided by the shovel and prow, and my object is to so improve the construction of such a plow that it will be strong, durable and efficient and can be controlled easily and effectively. I attain my object by the construction hereinafter more specifically described and illustrated in the accompanying drawings in which

Figure 1 is a longitudinal section of my improved plow. Fig. 2 is a top plan view on a slightly enlarged scale, of the plow, expellers and expeller operating means shown in Fig. 1, the upper portion of the housing being broken away for the sake of clearness. Fig. 3 is an enlarged half cross-section of the plow taken through one of the expellers. Fig. 4 is a front elevation of one of the expellers. Fig. 5 is an enlarged side elevation of the shovel and part of its lifting means. Fig. 6 is a detail in side elevation of the nose of the plow and of one of the brackets on which the shovel is hinged. Fig. 7 is an end elevation of part of one of the bearings for the expeller shaft. Fig. 8 is a side elevation of one of the frames of the shovel. Fig. 9 is an end elevation of the same. Fig. 10 is a front elevation of part of the shovel.

In the drawings like letters of reference indicate corresponding parts in the different figures.

A is the body of the plow which is suitably constructed to contain and support the different parts. It will, of course, be mounted in the usual manner on suitable trucks, but as no invention lies in those parts I merely show the wheels in dotted lines.

The front of the plow is provided with a transverse shovel B which is preferably hinged as shown so that its forward edge may be raised and lowered.

The shovel is formed of four I-bar frames *d'* on top of which is riveted a steel plate *e'*. A steel cutter plate *f'* is riveted below the frames and is also riveted at its forward

edge to the top plate. A steel tie plate *g'* connects the lower parts of the rear ends of the frames.

C is the nose of the plow on which the shovel is hinged. This nose is suitably formed of angle bars and plates and inclines upwardly and rearwardly to the lower side of the expeller chambers D. These are two in number, located one at each side of the central chamber E, being separated therefrom by the walls *a*. The expeller chambers are semi-cylindrical in form being open at their outer ends and their forward sides. The forward end of the central chamber E is made triangular in form to form the vertical prow F which serves to divide the snow lifted by the shovel and directed toward the expeller chambers. This prow preferably extends only to or slightly beyond the forward edge of the inclined nose C, and is secured thereto by suitable flanges and rivets.

It has previously been stated that the shovel B is hinged. This is effected preferably by suitably securing upon the end of the inclined nose C a plurality of brackets *b* in which the shaft *c* has its bearings. See Figs. 5 and 6.

The shovel is detachably secured to the shaft by being provided at the rear end of its frames *d'* with suitable sockets *d* to receive the shaft and in which the shaft is held by bolted caps *e*. By removing these caps the shovel may be removed at any time. See Fig. 5.

One or more set screws *f* are screwed into the frames of the shovel and bear against a portion of the frame of the end of the nose of the plow, as shown, to adjustably limit the lowest position of the forward edge of the shovel.

When clearing railway tracks of snow it is essential that the forward edge of the shovel be close to the rails to leave as little snow as possible upon them for the purpose of securing good adhesion between the rails and the wheels of the engine pushing the plow. When the plow is crossing tracks moving on to other tracks or sidings it becomes necessary to have several inches of clearance between the rail heads and the lowest part of the shovel. The shovel being hinged as above described, I am enabled to lift its forward edge at any time for the purpose set forth. For the purpose of thus swinging up the shovel I provide the following mechanism: A rearwardly extending

arm G is secured to the shaft *c*. To the end of this arm is pivotally connected the lower end of the connecting rod H, the upper end of which is pivotally connected to one arm of the bell crank lever I suitably fulcrumed on a stationary support. To the other arm of this bell crank lever is connected the lower end of the connecting rod J, the upper end of which is pivotally connected to the piston rod *g* of the steam cylinder K.

A steam pipe *h* leads from the cylinder K to the steam pipe L leading from the boiler M, located within the rear portion of the body of the plow. A valve *i* controls the admission of steam to or its exit from the cylinder and it is controlled by the rod *j* which leads rearwardly to a point within the plow over the raised platform N. Over this platform is located the cupola O in the roof of the car, the cupola, of course, being provided with glass sides for observation purposes. An operator standing on the platform within the cupola is thus enabled to raise or lower the shovel at will.

It will be noted when the forward edge of the shovel is raised as shown by dotted lines in Fig. 5 that the fulcrum of the bell crank lever I and the pivots of the connecting rod J are substantially in line. Hence the shovel having been raised will retain its raised position even when steam is cut off from the cylinder.

Within the expeller chambers are located the expellers P which are constructed as hereinafter described and are secured to the ends of the shaft Q. This shaft is journaled transversely of the plow in the central chamber E as shown. On the shaft are secured the driving pulleys *k* which are driven by a pair of silent steel driving chains of any approved construction from the driving pulley *l* on the shaft of the twin engines R. These engines take their steam supply from the main steam pipe L through the branches *n*. A single throttle valve *i'* in the steam pipe L controls the supply of steam to both cylinders of the engine, and this throttle valve itself is controlled by means of the valve stem *j'* which leads forward to the position over the platform N. The operator standing on the platform within the cupola has thus at his hand the means for controlling all the movable parts of the plow.

As the expellers are driven by two steel chains which possess practically no elasticity, it is of the utmost importance that the expeller shaft be set and maintained exactly parallel with the engine shaft, and that the expeller shaft and its bearings shall be in exact alinement with one another. This is very difficult to accomplish, as I have found by experience, but I have overcome all difficulties by a special construction which I will now described.

T are the bearings each of which has

formed at its under side an eye *p* fitting between the jaws *q* formed on the pedestals U which are connected with the frame of the plow. It will be noted particularly on reference to Figs. 1, 3 and 7 that a small amount of play is allowed between the sides of the eye and the jaws *q* permitting of a certain amount of fore and aft adjustment to the bearings.

Through the jaws and eyes extend the pins *r* which thus form longitudinal gudgeons for the bearings enabling the latter to adjust themselves horizontally to the shaft. The ends of the pins *r* are slightly reduced and a nut *s* is screwed on each end. It is evident that by adjusting these nuts the pins or gudgeons may be adjusted fore and aft of the plow and with them the bearings T.

A pin or bolt *t* passes through each eye *p* and the pin *r* thus giving the bearing a rigid connection with the pin *r*. By adjusting the bearings T the shaft may be adjusted to absolutely equalize the strain on the driving chains which is of great importance as otherwise one chain may be strained to the breaking point while the other is doing little or no work.

The expellers P each comprise a frusto-conical drum V to the periphery of which are secured a plurality of blades W. For the purpose of enabling these plates to be secured in position I preferably cast on each drum the flanges *u*. It will be noted particularly on reference to Fig. 2 that the blades are flat and straight from end to end instead of being helical as in ordinary screw construction. This is an important feature as I have found that screw expellers do not work well in handling snow. It is necessary that the expeller, instead of screwing out the snow, shall throw it out in straight lines, and with my expeller the snow slides along the straight blades, flies off therefrom in a lateral direction and is deposited a long distance from the tracks. A straight blade such as described best effects this result. It will be noted also that there is no overlapping of the blades each blade occupying only that proportion of the total periphery of the drum represented by unity divided by the number of blades. Three blades, I find give the best results. I further find it desirable to form at the inner forward end of each blade a cutter *w* which is directed forwardly in the direction of rotation of the expeller but preferably does not overlap the outer end of the adjoining blade (see Fig. 4). The drums being frusto conical in shape as shown aid materially in the prevention of the clogging of snow in the expellers as greater freedom of exit for the snow is thus given as it travels outwardly.

It will be noted on reference to Figs. 1 and 2 that a ring A' is formed in the main steam pipe L to pass around the smoke stack

B' of the boiler. The exhaust pipes C' from the engine cylinders also unite with the exhaust pipe D' exhausting into the smoke box of the boiler in locomotive style.

5 The weight of the parts of the plow forward of the front truck is very great and this is of course, much increased when the plow is at work in snow. I have, therefore, found it necessary to adopt a peculiar construction to give the necessary strength. It will be noted that the vertical plates *a* forming the sides of the central chamber E are extended below the stringers *c'* into the nose C of the plow to form part of and strengthen the same. Vertical plates *a'* which support the outer ends of the casings *b'*, which form one wall of the expeller chambers, are also extended into the nose to form part of and strengthen the same. These plates *a a'* extend well back and are suitably connected with the frame of the plow. As the plates *a a'* are merely cut out sufficiently to provide an opening for the expeller shaft and bearings and to give the openings for the outer ends of the expeller chambers they give the plow great vertical stiffness and the strength necessary to resist crushing when the plow is being forced into deep snow drifts.

What I claim as my invention is:—

30 1. In a snow plow the combination of a shovel; a central chamber provided with a triangular prow; and a semi-cylindrical expeller chamber at each side of the prow open at the side and front.

35 2. In a snow plow the combination of a shovel; a central chamber provided with a triangular prow; a semi-cylindrical expeller chamber at each side of the prow open at the side and front; and a rotary expeller horizontally journaled in each expeller chamber and adapted to discharge transversely of the machine.

40 3. A snow plow provided with a shovel hinged horizontally thereon at its forward end; and power actuated means for swinging up said shovel, said means being adapted to automatically lock when the shovel is in its up position.

45 4. In a snow plow provided with a rotary expeller at each side and a horizontal shaft carrying said expellers, the combination therewith of two bearings for the shaft located one toward each side of the plow; and pedestals for said bearings on which they are horizontally pivoted in a fore-and-aft direction.

50 5. In a snow plow provided with a rotary expeller at each side and a horizontal shaft carrying said expellers the combination therewith of two bearings for the shaft located one toward each side of the plow; pedestals for said bearings on which they are horizontally pivoted in a fore-and aft direction; and means for adjusting each bearing in a fore-and-aft direction.

6. In a snow plow the combination of a shovel; a central chamber provided with a triangular prow; a semi-cylindrical expeller chamber at each side of the prow open at the side and front; a horizontal shaft journaled transversely of the plow and extending into each expeller chamber; and an expeller in each chamber connected to the shaft and comprising a drum shaped as the frustum of a cone with the smaller end outward, and a plurality of inclined blades secured to the peripheral surface of the drum so that each blade occupies substantially only that proportion of the complete periphery of the drum equal to unity divided by the number of blades.

7. An expeller for a snow plow comprising a frusto-conical drum; a plurality of flat straight blades secured to the peripheral surface of the drum in an inclined position, the blades being arranged so that each blade occupies substantially only that proportion of the complete periphery of the drum equal to unity divided by the number of blades.

8. An expeller for a snow plow comprising a frusto-conical drum; a plurality of flat straight blades secured to the peripheral surface of the drum in an inclined position, the blades being arranged so that each blade occupies substantially only that proportion of the complete periphery of the drum equal to unity divided by the number of blades; and a cutter secured to the inner end of each blade directed in the direction of revolution of the expeller.

9. An expeller for a snow plow comprising a frusto conical drum; a plurality of flat straight blades secured to the peripheral surface of the drum in an inclined position, the blades being arranged so that each blade occupies substantially only that proportion of the complete periphery of the drum equal to unity divided by the number of blades, the blades being also so shaped that their outer edges lie in the periphery of an imaginary cylinder.

10. A snow plow provided with snow lifting and expelling means at its forward end; a motor for driving the expelling means located within the body of the plow; an elevated platform within the body of the plow over the expeller driving means; a cupola in the roof over said platform and means for controlling the motor from the platform.

11. A snow plow provided with a vertically adjustable snow lifting shovel at its forward end; expelling means located behind the shovel; power mechanism for lifting the shovel; a motor for driving the expelling means located within the body of the plow; an elevated platform within the body of the plow over the expeller driving means; a cupola in its roof; and means for controlling the motor and the shovel lifting means from the platform.

12. An expeller for a snow plow comprising a horizontally journaled drum and three flat straight blades secured to its peripheral surface in an inclined position, each blade occupying not more than substantially one-third of the periphery of the drum and provided at its inner end with a forwardly extending cutter.
13. In a snow plow the combination of a nose adapted to lift the snow; two vertical fore-and-aft plates forming a central chamber between them and extended into the nose to support the same; triangular plates closing the forward end of said chamber to form a prow; semi-cylindrical casings forming expeller chambers supported at their inner ends by the aforesaid plates; vertical fore-and-aft plates supporting the outer ends of the expeller chambers and extended into the nose to support the same.
14. In a snow plow a shovel comprising a plurality of frames, a steel plate riveted on top of said frames, and a cutter plate riveted to the underside of the said frames and to the forward edge of the top plate, and capped eyes or sockets formed at the rear ends of the frames.
15. In a snow plow a shovel comprising a plurality of frames, a steel plate riveted on top of said frames, and a cutter plate riveted to the underside of the said frames and to the forward edge of the top plate, a tie plate secured to the frames at their rear ends, and capped eyes or sockets formed at the rear ends of the frames.

Toronto this 9th day of Feb. 1910.

WILLIAM HARTILL-LAW.

Signed in the presence of—

J. EDW. MAYBEE,

E. P. HALL.