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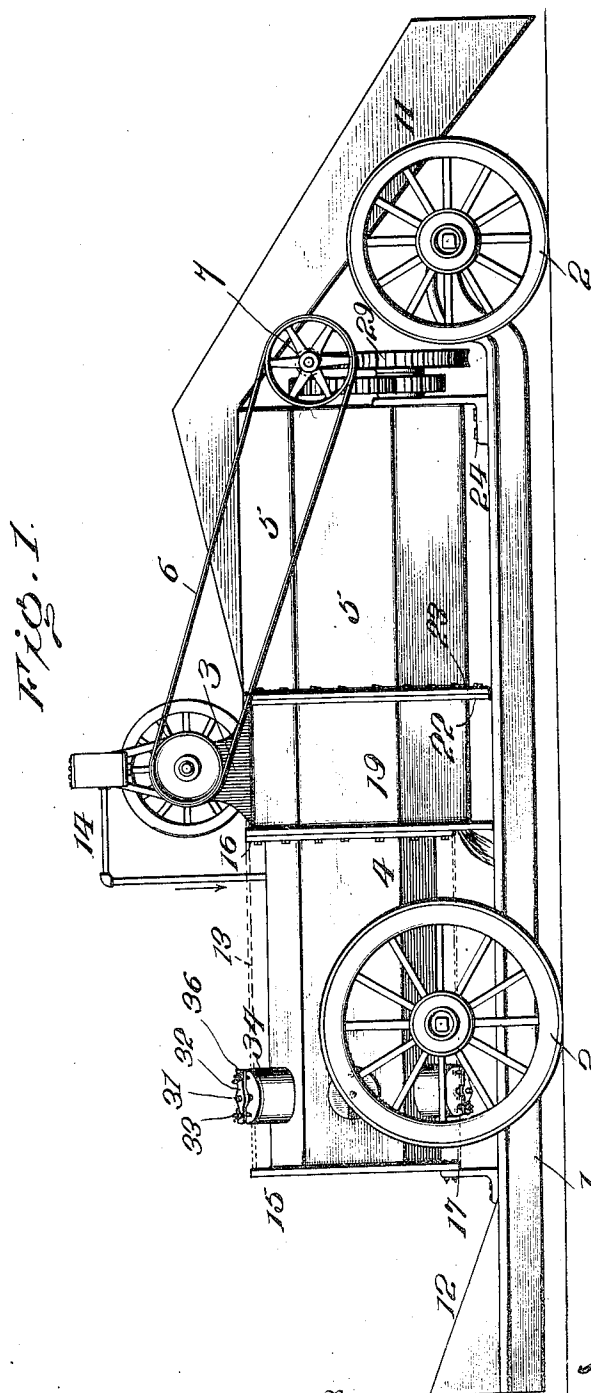
PATENTED MAY 7, 1907.

H. S. FARQUHAR.

MEANS FOR COMPRESSING AND REMOVING SNOW.

APPLICATION FILED AUG. 14, 1905.

4 SHEETS—SHEET 1.



Witnesses

Witnesses
L. A. Schmidt.

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Inventor

H. S. Farquhar

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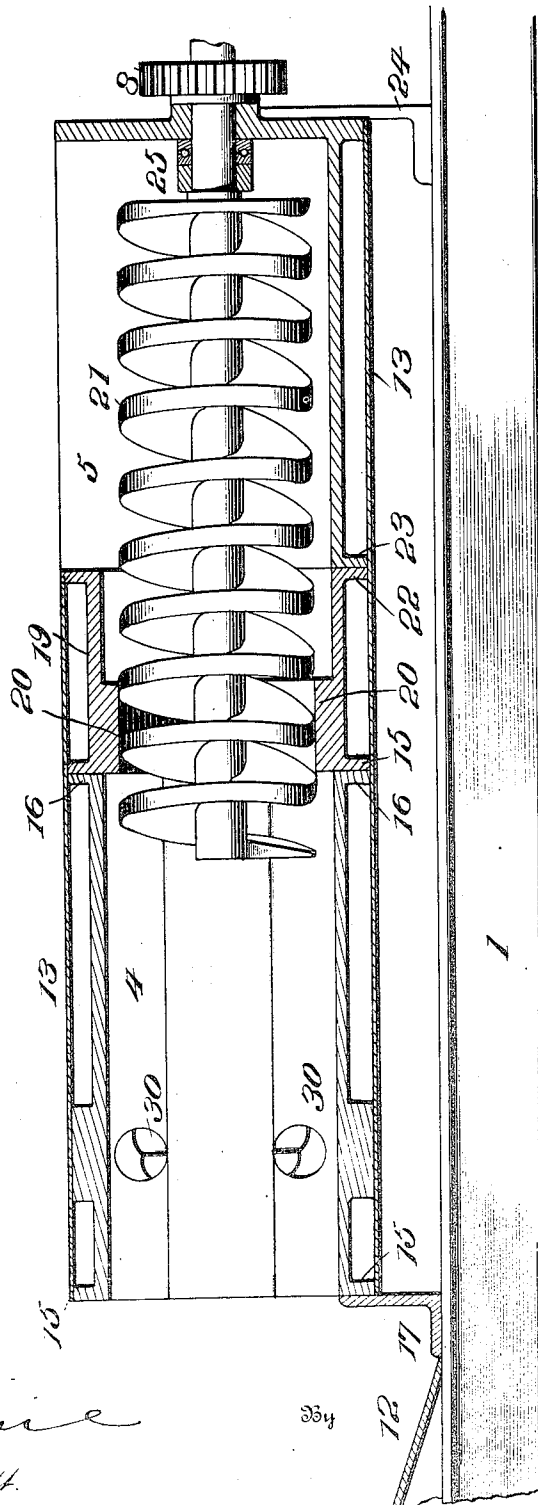
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Fig. 2.



Witnesses

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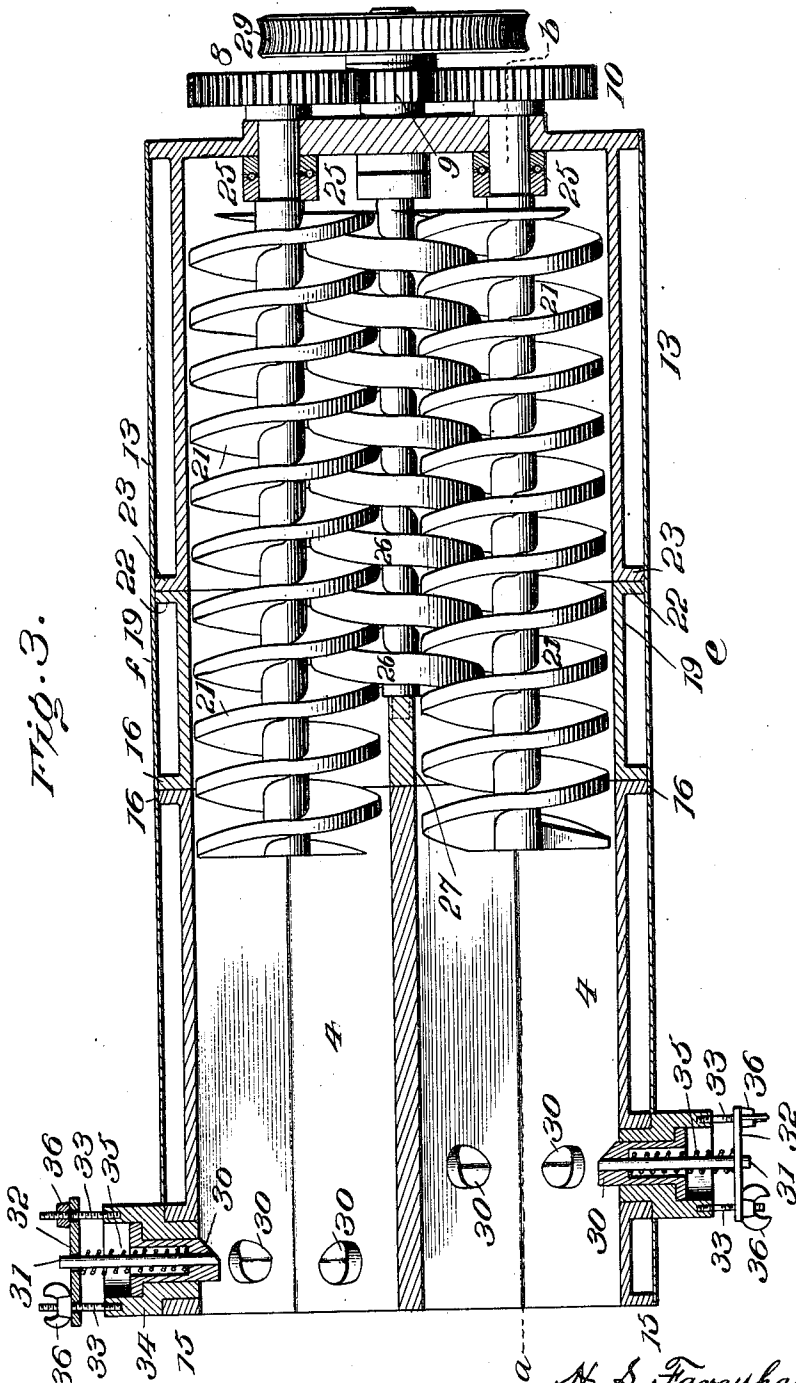
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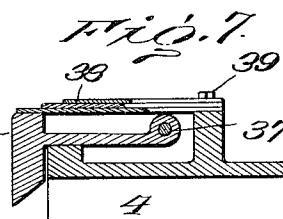
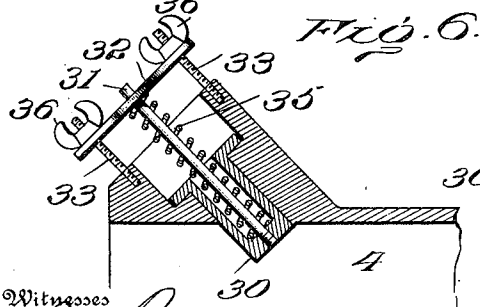
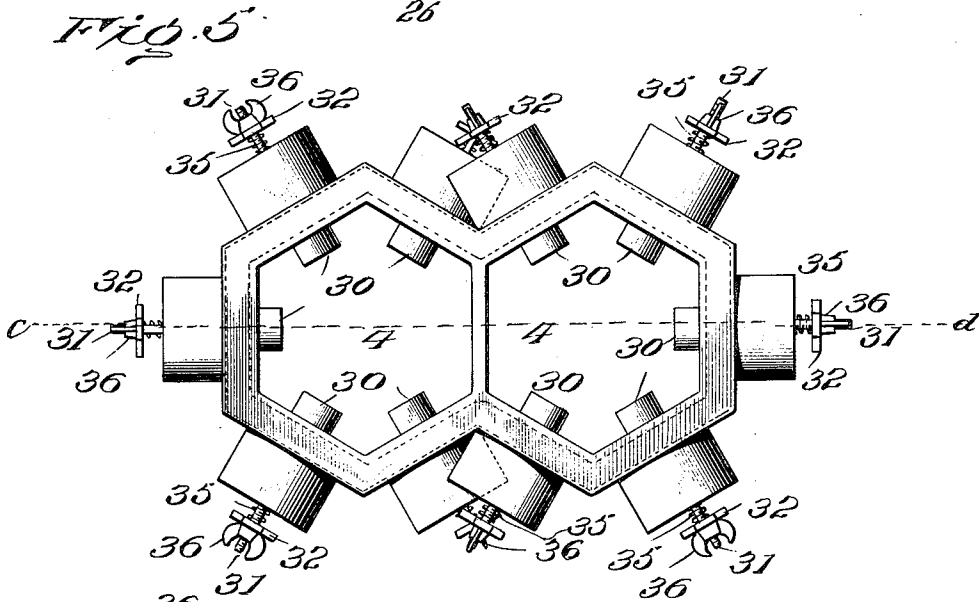
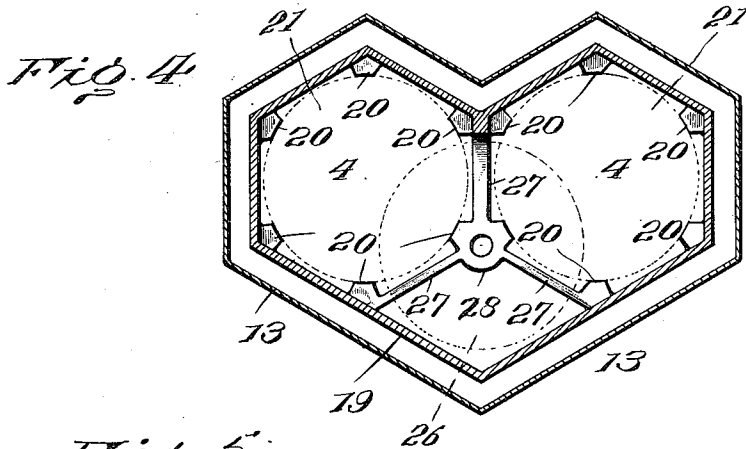
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4 SHEETS—SHEET 4.



Witnesses
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UNITED STATES PATENT OFFICE.

HENRY S. FARQUHAR, OF WASHINGTON, DISTRICT OF COLUMBIA.

MEANS FOR COMPRESSING AND REMOVING SNOW.

No. 852,833.

Specification of Letters Patent.

Patented May 7, 1907.

Application filed August 14, 1905. Serial No. 274,168.

To all whom it may concern:

Be it known that I, HENRY S. FARQUHAR, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Machines for Compressing Snow and Removing the Same from Thoroughfares; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to certain new and useful improvements in machines for compressing, and also for removing snow from thoroughfares, and particularly to that type shown and described in Letters Patent of the United States, granted to me October 8, 1901, No. 684,052, and in which is involved the generic principle of subjecting the snow which has been gathered by the machine, to the action of compression screws whereby the snow is condensed and pressed into a continuous solid mass and forced out of the compression chamber and then broken or separated into sections of convenient length for handling.

For a more full and complete understanding of the construction and operation of the said machine; reference is specifically made to the Letters Patent hereinbefore recited.

My present invention has for its object to not only simplify the construction of machines of the type referred to, but to render more certain and effective the action of the compression screws.

My invention consists in the features of construction and arrangement hereinafter and in detail described and claimed. In order that those skilled in the art to which my invention appertains may know how to make and use my improved machine and fully appreciate all of its advantages, I will proceed to describe the construction and operation of the same referring by numerals to the accompanying drawings in which,

Figure 1 is a side elevation of my improved apparatus mounted upon wheels adapted to convey it from one locality to another, and provided with means for automatically supplying the machine with snow to be operated upon. Fig. 2 is a longitudinal vertical section through one of the compression chambers taken on the line *a—b* of Fig. 3, and showing the compression screw therein in elevation. Fig. 3 is a horizontal section

taken on the line *c—d* of Fig. 5, with the two compression screws and the idler or stripper screw, all in plan. Fig. 4 is a transverse section taken on the line *e—f*, of Fig. 3, with the screws removed, the circular broken lines indicating the plan of the peripheral limits of the screws when in position. Fig. 5 is an end view of the double or twin compression chambers looking from the left hand of Fig. 3. Figs. 6 and 7 are detail views in section, showing modifications of the resistance lugs used in connection with the compression chambers.

Similar reference numerals indicate like parts in the several figures of the drawing.

The machine consists generally of the two snow compression chambers; an engine; two compressor screws located within the compression chambers; and an idler or stripper screw, all suitably geared together at the forward ends and operated by a worm gear driven through suitable connection with the engine; and an inclined scoop which is designed as a means for forcing the snow from the surface of the thoroughfare into the hopper of the machine when it may be desired to accomplish this result by propelling the machine in a forward direction. The machine thus constituted is either mounted upon a frame composed of beams mounted upon wheels or the axles of the wheels may be connected directly with the stationary parts and suitable means, such as described in my Letters Patent hereinbefore referred to, are employed for utilizing the power of the engine for moving the apparatus along the thoroughfare either continuously as would be the case when it is used to automatically supply the snow to the hopper, or from one locality to another when the snow is supplied to the hopper by hand as will be hereinafter referred to.

Fig. 1 of the drawings is intended to illustrate these general features of construction and the other figures are designed to illustrate the specific details of construction of the several parts of the machine which constitute the important features of my invention and therefore attention is especially directed to Figs. 2, 3, 4, and 5.

Referring first to Fig. 1, the machine is mounted upon a suitable frame composed of beams 1 or as heretofore stated the axles of the wheels 2—2 may be connected directly to the stationary parts of the machine.

3 is an engine boiler and furnace of any

suitable construction mounted upon the machine over the compression chambers 4, and at the rear of the snow hopper 5.

Power is applied to the compression screws through the medium of a suitable belt or sprocket chain 6, a worm gear 7 and gears 8, 9, 10 hereinafter more specifically referred to.

11 is an inclined scoop extending from the top of the open hopper 5, and terminating at a point in advance of the front wheels of the machine and in such relation to the road bed that the forward movement of the machine will cause the snow to be forced up the incline bottom of the scoop and deposited in the hopper. In rear of the compression chambers is secured a fixed and rigid incline 12 designed and operating to deflect the rearwardly moving blocks of compressed snow out of a right line and to cause them to be automatically broken off into convenient lengths for handling, and forced backward and off of the machine by the succeeding blocks. I have shown this incline 12 arranged to lift the rear end of the compressed body of snow, but I may arrange the breaking device in the manner shown in the Letters Patent hereinbefore referred to, and so that the breaking pressure will be exerted in a downward direction.

13 is a casing, preferably of sheet iron which envelops the machine in such manner as to produce a surrounding jacket space into which the exhaust steam from the engine is conveyed by a pipe 14 leading from the engine, in order that the compression chambers and the screws located therein may be kept at a temperature slightly above the freezing point and to prevent breakage which might otherwise take place.

Having now described in general the principal parts of the machine as illustrated in Fig. 1 of the drawing, I will proceed to describe more in detail the particular construction of the several parts, attention being directed to Figs. 2, 3, 4 and 5 which are upon enlarged scale.

The compression chambers 4 are made of cast iron and are of hexagonal form in cross-section as clearly shown at Figs. 4 and 5, and are formed with exterior flanges 15 and 16 and when they are mounted upon a frame such as 1 heretofore referred to, the flanges 15 are bolted to angle irons 17, which latter are bolted to the frame as clearly illustrated in Figs. 1 and 2. The forward flanges 16 of the compression chambers are bolted to corresponding flanges 18 surrounding the rear end of a hexagonal casting 19 which is formed interiorly for a portion of its length with a series of curved projections 20 which constitute bearings for, the peripheries of the rear ends of the two compression screws 21.

This casting 19 also serves as a part of the compression chambers, and it in turn is con-

nected by flange 22 to similar flanges 23 upon the hopper casting 5, the front end of which is connected to the frame 1 by angle irons 24 similar to the angle irons 17 at the rear of the compression chambers 4. The shafts of the compression screws 21 are suitably journaled in the front of the hopper casting 5 and are provided with ring collars or shoulders 25 on the inside of the casting 5 to receive the longitudinal forward thrust of the screws.

26 is an idler or stripping screw mounted in a plane below the axes of the compression screws 21, the bottoms of the casting 19 and the hopper casting 5 being extended downwardly for this purpose as shown at Fig. 4 and the casting 19 is formed with spider arms 27 and a central hub 28 which constitutes a bearing for the rear end of the shaft or axis of the idler 26 as best seen in Fig. 4. The forward end of this idler screw is journaled in the front of the hopper casting 5 in the same manner as the two compression screws 21 as best shown in Fig. 3.

The compression screws and the idler or stripper screw are provided with gears 8, 9, and 10 heretofore referred to, which mesh as clearly shown at Fig. 3, and the extreme end of the idler or stripper screw is provided with a gear 29, which meshes with the driving worm gear 7, and the three screws are thus caused to rotate in an obvious manner.

30 are resistance lugs for retarding the rearward movement of the snow, and to thus secure the proper compression of the same, while at the same time permitting the snow when thoroughly compressed to overcome such resistance and to be forced out of the machine and against the automatic breaker 12. These resistance lugs perform their function in substantially the same manner as the resistance lugs shown and described in my Letters Patent hereinbefore referred to, but vary in details of construction therefrom, and I will proceed to describe the improved form. They are T shaped at their outer ends and formed with a central well surrounding a stem 31, which may be integral with the lug, or secured in any suitable manner to the same.

32 is a flat bar which passes over the end of the stem 31 and two threaded posts 33 projecting from the lug casting or holder 34 within which the lugs are adapted to reciprocate.

Within the well of the lug and surrounding the stem thereof is a spiral spring 35 which is confined between the bar 32 and the bottom of the well and the tension of which may be adjusted in an obvious manner by wing nuts 36 upon the threaded posts 33 to increase or diminish the resisting effect of the lugs.

The front portion of the lugs which project within the compression chamber may be beveled as shown in Fig. 3, or they may be arranged at an angle to the axis of the com-

pression chamber as illustrated at Fig. 6 in which case the terminal end of the lug will be inclined as shown, or as shown at Fig. 7 the lugs may be of hammer shape and pivoted or hinged at 37 within a recess in the outer surface of the compression chamber casting so that the beveled end will project into the chamber and be yieldingly held by flat leaf springs 38 having one end secured in place by a screw bolt 39 with the lugs arranged in either case as described, they will according to the tension of the holding springs offer in a corresponding degree greater or less resistance to the snow to secure greater or less density before the resistance offered by said lugs is overcome. These lugs are located in the hexagonal faces of each of the compression chambers and the lugs of both chambers may all be in the same plane or offset relatively as shown at Fig. 3.

The castings 5 and 19 constituting a part of the general casing, are carried downward and at an angle as clearly shown at Fig. 4 to provide space for the idler or stripper screw 26, and this space constitutes a drainage through which the water eliminated from the snow flows and from which it passes to the thoroughfare out of the rear end as indicated by the curved broken lines shown in Fig. 1. The water eliminated from the snow in the compression chamber 4 is free to flow from either end thereof in an obvious manner.

Having described the construction of my improved machine I will now describe the operation of the same and in doing so will explain the importance and advantages of the presence of the idler or stripping screw in its relation with the two compression screws.

As I have heretofore explained, when the machine is automatically supplied with snow by propelling it against the same and causing it to move up the inclined scoop and into the hopper, or when transported from one locality to another and the snow is shoveled by hand into the hopper and the screws are set in motion by the engine, the snow within the hopper is moved by the compression screws 21 rearward through the central casting 19 forcing it into the compression chambers 4 and against the resistance lugs 30 which arrest the rearward movement of the snow and cause the mass to be compressed by the accumulation of snow forced into the compression chambers by the screws 21 until the density of the mass is such that the pressure exerted by the screws will cause the same to overcome the resistance of the lugs, which plowing longitudinal grooves or channels in the compressed mass permits the same to move rearward against the breaker 12, which deflecting the compressed mass out of its path causes the same to be successively broken into lengths dependent upon the location and inclination of the breaker 12. In

this general operation my present machine operates in substantially the same manner as that shown and described in my patent herein referred to, but I have found from practical experience that when it is desired to compress the snow to a high degree the resistance offered to the compression action of the screws has a tendency to cause the snow within the convolutions of the screws to revolve with said screws, and not travel longitudinally, which is of course necessary to secure its compression. To overcome this tendency I have in my present machine provided the idler or stripping screw 26 which meshing as shown with both of the compression screws 21, and rotating in a direction opposite to the rotation of these compression screws, strips the snow from the latter and prevents its rotation therewith, and consequently insures its longitudinal movement rearward and into the compression chambers 4, where it is necessarily subjected to complete and full compression. This is highly important in the treatment of snow under certain conditions, and I desire it to be understood that this is a generic feature of invention in my improved machine.

The casing or steam jacket 13, which surrounds the machine rests upon the flanges by which the sections are connected, and consequently a steam space is provided between the jacket and the machine into which the exhaust steam from the engine may freely circulate, and which as heretofore stated keeps the working parts of the machine at a temperature above freezing to prevent breakage, and also serves to put the snow into condition for ready compression.

While my improved machine is especially adapted for the removal of snow from the thoroughfares, it will be understood that it may also be used successfully for compressing snow into blocks of suitable form which may be used in lieu of ice for refrigerating purposes.

While I have shown in the drawings and described a construction involving twin compression chambers and twin compression screws with the idler or stripping screw arranged in a plane below the compression screws and meshing therewith, it will be understood that a single compression chamber and a single compression screw may be used with the idler or stripping screw, or that a multiple of the compression chamber and compression screw not exceeding four may be used in connection with a single idler or stripping screw without departing from the genus of my invention which resides in the broad idea of an idler or stripping screw so arranged relatively with the compression screw or screws as to prevent the snow conveyed to the compression chamber or chambers from adhering to and rotating with the compression screw or screws.

Having described the construction and operation of my improved machine what I claim as new and desire to secure by Letters Patent is:

5 1. In a snow compressing machine, a compression chamber into which the snow is conveyed and compressed; a compressing screw for conveying and compressing the snow; means for retarding the snow during compression; an idler or stripping screw meshing with the compressing screw, and means for rotating the compressing screw and the idler or stripping screw in reverse directions, whereby the snow conveyed by the compressing screw is prevented from adhering to and rotating with said screw, substantially as hereinbefore set forth.

2. In a snow compressing machine, two or more compression chambers; two or more screws for conveying snow fed from a hopper, into the compression chambers and compressing the same; means for retarding the snow under compression; and idler screw meshing with the compression screws, and means for rotating the compression screws in one direction and the idler screw in an opposite direction, whereby the snow conveyed by the compression screws is prevented from adhering thereto substantially as hereinbefore set forth.

3. In a machine such as described, in combination with means for propelling the machine, and a hopper having conveying screws therein, an inclined scoop at the forward end of the machine having its front end adjacent to the plane of a thoroughfare and its rear elevated end terminating in the hopper above the conveyer screws therein, whereby the forward travel of the machine will cause the snow in front of the scoop to be picked up and forced rearward and into the hopper and to the conveyer screws therein, as hereinbefore set forth.

4. In a snow compressing machine such as described and embodying snow compression chambers and compression screws, resistance

lugs located near the rear end of the compression chambers and consisting of a body having a central well with a stem located therein; a coil spring surrounding the stem; a plate located over the stem and screw threaded posts each side of the stem, and wing nuts located upon the threaded posts whereby the resistance offered by the lugs may be adjusted, substantially as and for the purpose set forth.

5. In a machine such as described, spring resistance lugs, adjacent to the rear ends of the compression chambers and projecting into said chambers at an angle to the axis of said chambers substantially as shown and described.

6. In a snow compressing machine such as described a heating jacket surrounding the compression chambers and compression screws and means for supplying heat to said jacket, whereby the screws and chambers are maintained at a temperature above freezing to prevent breakage and the snow is put in condition for ready compression as hereinbefore set forth.

7. In a snow compressing machine such as described and embodying compression chambers; compression screws, and an idler or stripping screw geared together, means for rotating said screws substantially as described.

8. In a snow compressing machine such as described and involving twin compression chambers and twin compression screws, and an idler or stripping screw, the downwardly extended casing beneath the idler or stripping screw to constitute a trough for the reception and exit of water eliminated from the snow, substantially as hereinbefore set forth.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

HENRY S. FARQUHAR.

Witnesses:

D. G. STUART,
WM. M. HANNAY.