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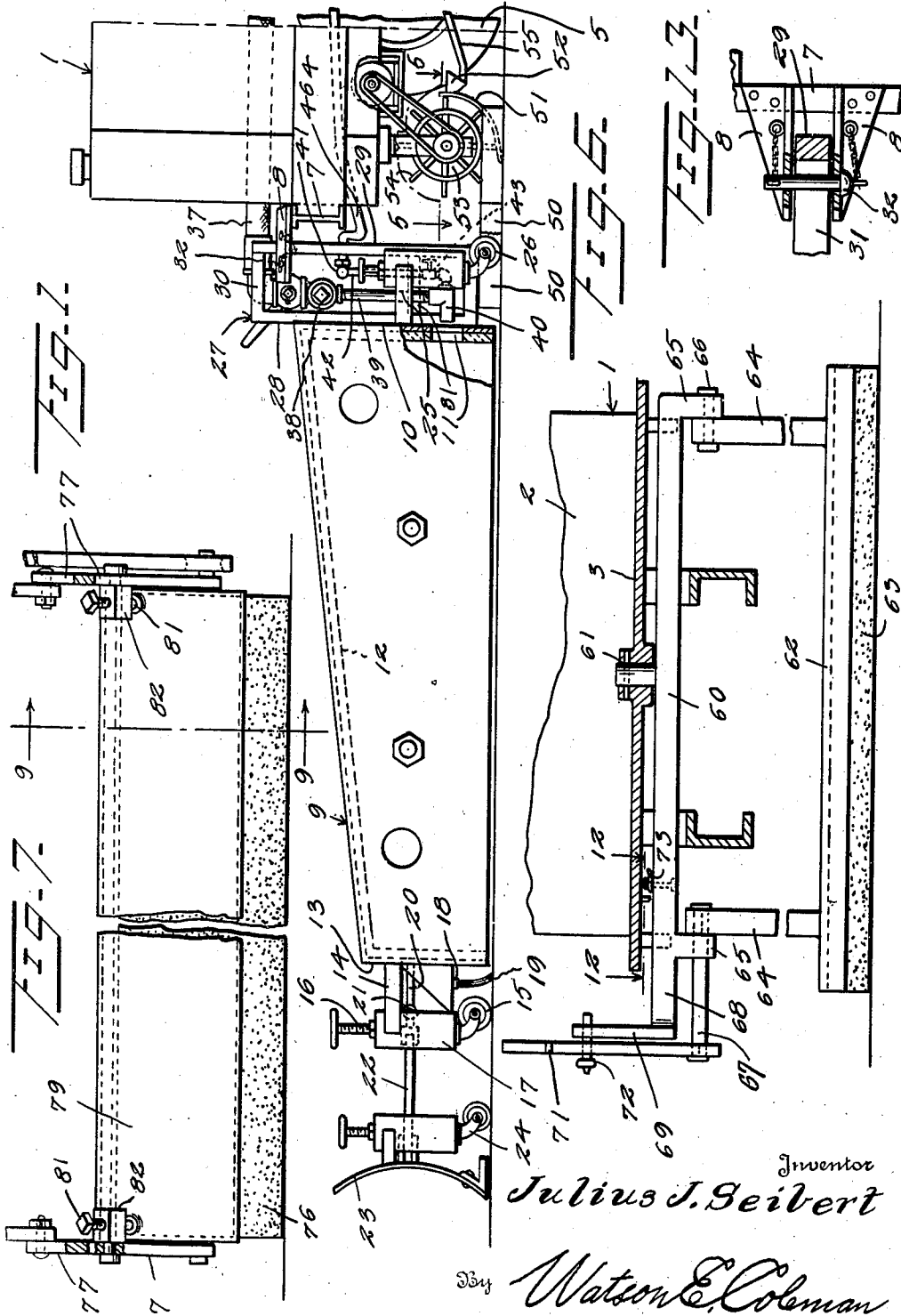
J. J. SEIBERT

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SNOW AND ICE REMOVING MACHINE

Filed Feb. 5, 1941

4 Sheets-Sheet 1



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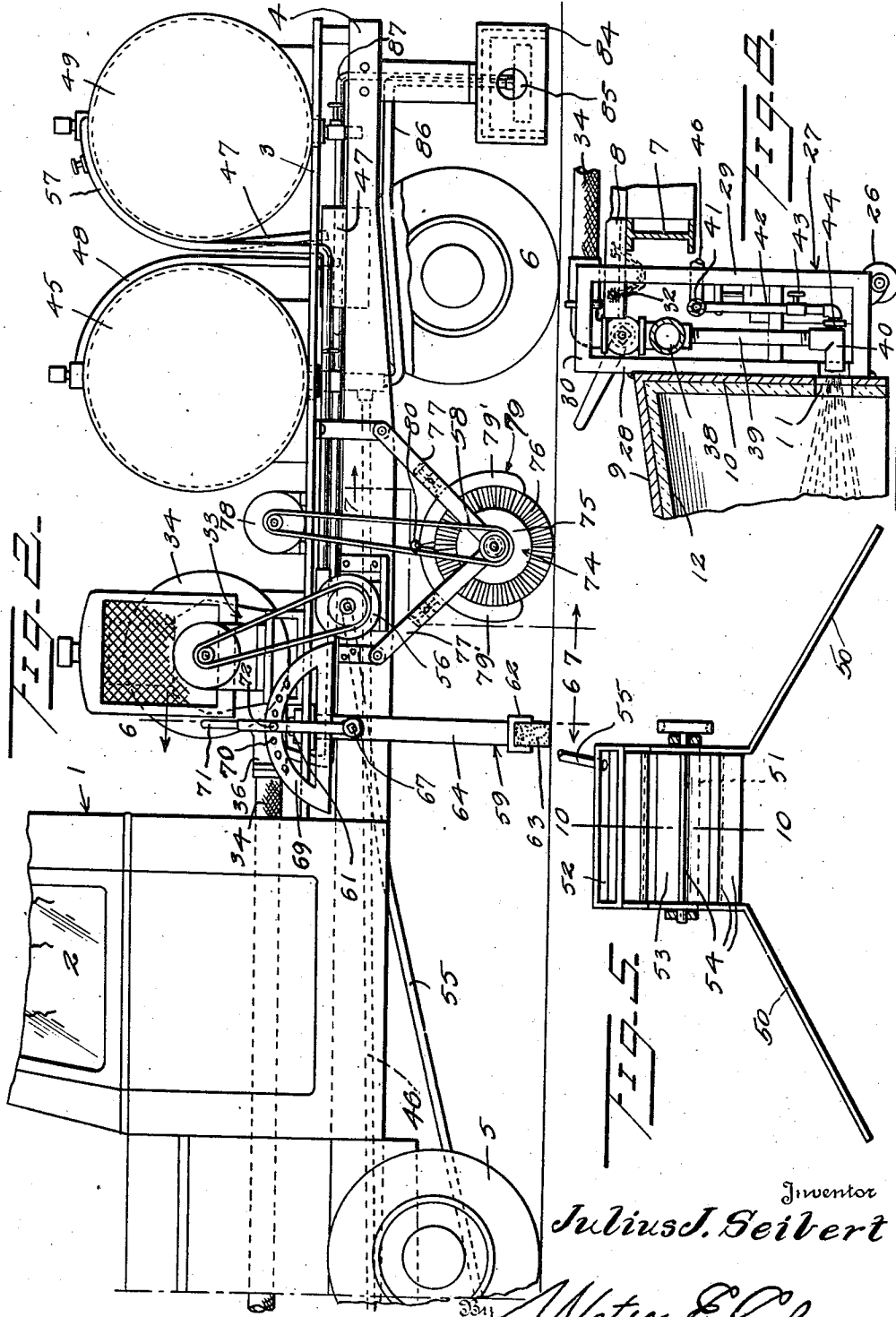
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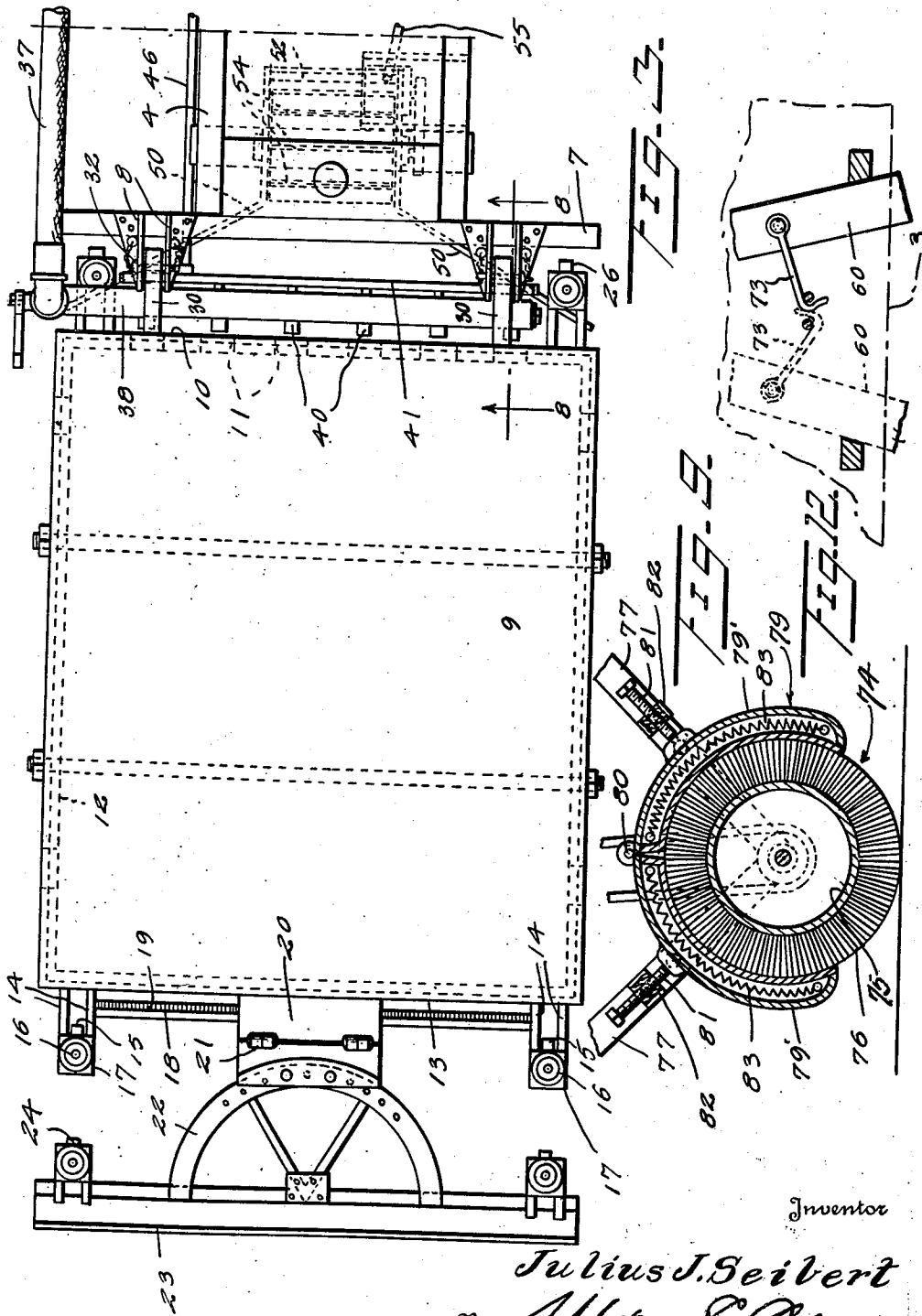
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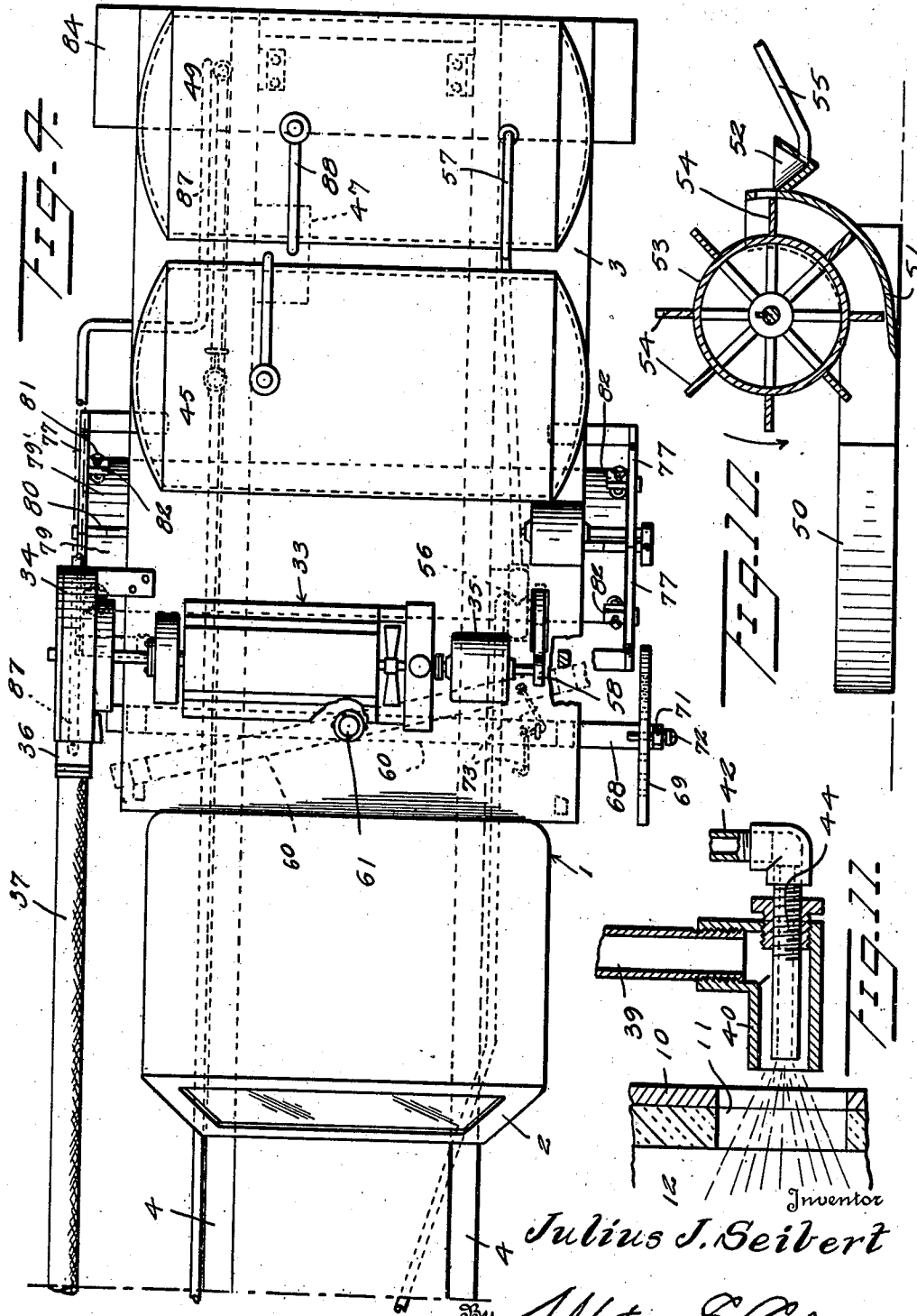
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SNOW AND ICE REMOVING MACHINE

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SNOW AND ICE REMOVING MACHINE

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3 Claims. (Cl. 37-12)

This invention relates generally to the class of material handling and pertains more particularly to improvements in mechanism for removing snow and ice from highways, flying fields or other areas of similar character.

A principal object of the present invention is to provide a mechanism by means of which snow or ice covered areas may be efficiently cleaned and such areas left entirely dry for free use by motor vehicles, airplanes or pedestrians.

Another object of the invention is to provide a mechanism for clearing highways, streets, airport runways and other areas of snow and ice without piling up the snow at the sides of the areas where it might constitute a hazard to vehicles and without creating an undesirable discharge of water along the sides of such areas, the mechanism being of such character as to melt the snow or ice and pick up the water thus produced for transportation to a suitable discharge point.

Still another object of the invention is to provide in a mechanism of the character stated, means for mopping over and completely drying the area from which the snow or ice has been removed.

A still further object of the invention is to provide a novel mounting arrangement for a surface heating device upon the front of a wheeled carrier whereby such device may be easily handled to swing with the front of the carrier as the latter is guided over the area to be cleaned.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings, it being understood, however, that the invention is not to be considered as limited by the specific illustration or description but that such illustration and description constitutes a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a view in side elevation with portions broken away, of the forward half of the mechanism embodying the present invention.

Fig. 2 is a view in side elevation of the rear half of the mechanism.

Fig. 3 is a view in top plan of the forward half of the mechanism as illustrated in Fig. 1.

Fig. 4 is a view in top plan of the mechanism as illustrated in Fig. 2.

Fig. 5 is a horizontal section taken on the line 5-5 of Fig. 1.

Fig. 6 is a vertical transverse section taken on the line 6-6 of Fig. 2.

Fig. 7 is a vertical transverse section taken substantially on the line 7-7 of Fig. 2.

Fig. 8 is a vertical longitudinal section taken on the line 8-8 of Fig. 3.

Fig. 9 is a transverse section taken on the line 9-9 of Fig. 7.

Fig. 10 is a sectional view on the line 10-10 of Fig. 5.

Fig. 11 is a detailed sectional view through a flame nozzle and the adjacent portion of the heater box.

Fig. 12 is a sectional view on the line 12-12 of Fig. 6.

Fig. 13 is a detailed view on an enlarged scale partly in section and partly in top plan of one of the coupling units between the carrier and the heat box.

Referring now more particularly to the drawings, the numeral 1 generally designates a carrier to which the mechanism of the present invention is attached and by which such mechanism is moved over the area to be cleaned. This carrier is here shown as being in the form of a truck having the usual driver's cab 2 and at the rear of the cab a floor structure 3, which is supported on the chassis frame 4, which in turn is supported upon the usual front and rear wheels 5 and 6, respectively. Obviously, as will become apparent following the description of the mechanism, the said mechanism may be carried upon any other type of conveyor, therefore, it is to be understood that the invention is not to be limited to use with the specific type of carrier here shown.

At the front of the carrier there is secured transversely thereof a beam 7 of any suitable character but preferably in the form of an I-beam as shown, and secured to and extending forwardly from the top of this beam upon opposite sides of the longitudinal center of the carrier are the pairs of spaced arms 8, each pair constituting a unit of a coupling by which a heat box indicated generally by the numeral 9, is attached to the front of the carrier.

The heat box 9 is in the form of a rectangular housing of sheet metal having a rear vertical wall 10, which is provided with a plurality of burner openings 11, and these burner openings are arranged in a line extending transversely of the box. The bottom of the box is open and directed toward the ground so that the heat developed therein will be discharged downwardly against the snow surface or the ice covering the ground surface. For the purpose of conserving the heat or preventing its dissipation through the side walls and top of the box, the inner surfaces of these walls are covered by a suitable heat insulation material 12.

The forward or front vertical wall of the heat box is indicated by the numeral 13 and there are secured to the front wall the forwardly extending bracket arms 14, each of which carries a vertically adjustable castor wheel 15. These castor wheels are here shown as being connected with adjusting screws 16, which work in vertically supported sleeves or guides 17. This is one means of effecting the adjustment of the wheels, but it is to be understood that any other means may be employed such as an air or hydraulic jack or the like.

Secured transversely of the front of the box 9 is a bar 18, to which are attached downwardly and rearwardly flexed steel fingers or scrapers 19 which, when the box is disposed in proper position with respect to the ground, engage the ground or underlying snow-covered or ice-covered surface to break up the same as the heater is moved forwardly. From the central portion of the forward wall 13 there also extends the carrier plate 20 with which is hingedly coupled, as at 21, an arcuate yoke 22 which is adapted to turn on a vertical axis to be adjustably secured to the front of the box and to locate the forwardly directed scoop or shovel 23 directly transversely of the path of travel of the machine or at an angle oblique to such path, as may be desired. The outer ends of this shovel are adjustably supported by the castor units 24.

The lower part of the shovel 23 may be provided with heating coils, not shown, supplied with electric current from a suitable source so that the adherence to the shovel of snow as it is being scraped up, will be prevented.

The rear or back wall 10 of the heat box also carries arms 25 which support castor wheels 26 in the same manner as the castor wheels 15 are supported at the front of the box. In this way, it will be readily seen that the lower open side of the box may be readily adjusted with respect to the underlying ground surface and that it will also be steadily supported at a predetermined distance from the ground and may be readily swung from one side to the other of the path of travel as the carrier is turned.

As previously stated, the arms 8 which are secured to and extend forwardly from the forward bumper 7 form a unit of the coupling means between the bumper and the heat box. The other unit of such coupling means comprises a vertical yoke indicated generally by the numeral 27 which is secured between each pair of arms 8 and by which relative up and down movement is permitted between the heat box 9 and the bumper 7. This other unit of each coupling is in the form of a vertical frame consisting of a forward upright post 28 secured to the rear wall of the heat box, a second and readily positioned post 29, and transverse upper and lower connecting members 30 and 31, respectively, which thus provide an elongated vertical frame as illustrated, which when positioned between the pair of arms 8, has extended therethrough a coupling pin 32 which passes through the adjacent pair of arms. In this manner, it will be readily seen that there is provided a coupling between the heat box and the bumper of the carrier which prevents the heat box from having loose side to side movement, but which allows the box to move up and down, as may be necessary, and also the coupling is such that as the front wheels of the carrier are turned to guide the carrier along a curved path, the heat box will be forced to swing or turn accordingly.

On the floor 3 of the carrier there is mounted a prime mover indicated generally by the numeral 33, which may be in the form of a gasoline engine and which is employed for operating a blower 34 with which it is operatively coupled, and a current generator 35 with which it is also coupled. The outlet 36 of the blower is connected by the pipe 37 with an air manifold 38 which extends along the rear of the heat box and from which extend downwardly the short supply pipes 39 through which air is supplied to burner nozzles 40, each of which is located behind the heat box to discharge or direct a heating flame through the adjacent wall opening 11.

There also extends along the rear wall of the heat box a fuel manifold which is indicated generally by the numeral 41, this manifold supplying through the short downwardly extending pipes 42, which are controlled by valves 43, the burner jets 44 with fuel oil which is ignited in and blown from the nozzles 40 into the heat box.

The fuel manifold is supplied from a fuel tank 45 mounted upon the carrier as shown, the fuel passing under pressure from the supply tank through a supply line 46.

A compressed air tank 47 is mounted in a convenient position upon the carrier and supplies air under pressure through the pipe 48 to the top of the fuel tank 45. There is also mounted upon the carrier a tank 49 for the reception of water which is picked up from the ground behind the heat box by the mechanism about to be described.

The water pick-up mechanism which is carried upon the under side of the carrier immediately behind the heat box comprises the pair of ground engaging forwardly diverging wipers 50 which at their rear or convergent ends are coupled with a scoop-like scraper 51, the lower edge of which is in close proximity to the ground surface or wiper thereon, as shown. Immediately at the rear of this scoop 51 and extending lengthwise thereof and, consequently, transversely of the longitudinal center of the path of travel of the machine, is a water receiving trough 52. The wipers 50 converge toward the scoop 51 and are joined at their inner ends to the ends of the scoop and thus it will be apparent that all of the water which the wipers collect in the forward movement of the machine will be guided rearwardly and toward the center of the path of travel of the machine and into the scoop 50.

Suspended for rotation on an axis extending lengthwise of the scoop is a rotatably mounted drum or cylinder, the periphery of which is in close proximity to the curved forward face of the scoop 51, and extending lengthwise of the cylinder 53 are flexible wiper blades 54 which as the cylinder rotates, wipe the surface of the ground immediately in advance of the scoop 51 and move rearwardly and upwardly over the surface of the scoop to lift water to the top thereof for discharge rearwardly into the trough 52. This rotary water lifting device is preferably operated by an electric motor coupled with one end thereof and supplied with current from the generator 35.

Connected with the bottom of the trough 52 is a water pipe 55 which leads rearwardly to a pump 56 of suitable type for extracting water from the trough and for passing it on through the pipe 57 into the top of the water tank 49.

The pump 56 may be connected directly with

the shaft of the current generator 35 through the medium of the belt connection 58 shown in Fig. 2.

Rearwardly of the water and slush pick-up wheel and trough 52—53, there is placed a squeegee or surface wiper which is indicated generally by the numeral 59. This wiper is of a length to extend substantially entirely across the machine to the width of the area covered by the heat box 9 and is mounted to be oscillated on a vertical axis so that it may be placed at an oblique angle to the path of travel of the machine and is also mounted for oscillation on a horizontal axis extending transversely of the carrier so that it may be raised and lowered with respect to the underlying surface as desired.

The squeegee or wiper structure comprises a bar 60 which is provided intermediate its ends with a pivot post 61 which is pivotally secured in a suitable manner to the floor 3 of the carrier so that the bar will be supported horizontally below the floor and may oscillate on a vertical axis. Parallel with and below the bar 60 is the squeegee or wiper proper which comprises a body portion 62 carrying a suitable wiper material 63 and the body 62 is connected by vertical arms 64 with the downturned terminal portions or bearings 65, which are carried by the bar 60, by means of trunnion or pivot pins 66 and 67. These pivot pins extend parallel to the bar and wiper so that the latter may oscillate on a horizontal axis.

The bar 60 is extended at one side of the carrier, as indicated at 68, and carries an upstanding arcuate plate 69. This plate is provided with a series of apertures 70 disposed in an arc concentric with the horizontal oscillation axis for the squeegee.

The pivot or trunnion 67 extends outwardly and carries upon its outer end the upstanding lever 71 which is disposed in front of the plate 69 and is adjustably coupled thereto by means of a lock pin 72 which is adapted for selective engagement in the apertures 70. By means of the lever 71, the squeegee may be rocked into or out of engagement with the underlying surface and by means of the pivot 61, it may be oscillated to an oblique angular position with relation to the path of movement of the machine, so that water wiped up from the underlying surface will be carried off to the side of the machine.

When the squeegee has been oscillated on its vertical axis to an oblique position across the carrier, it is secured in place by suitable retaining hooks 73 carried upon the top of the bar 60, as shown in Fig. 3, to engage an eye secured to the floor 3.

Supported rearwardly of the squeegee unit 59 and extending transversely of the carrier is a mop-up roller indicated generally by the numeral 74 and comprising a cylinder 75 having over its peripheral surface a suitable absorbent material 76 which will wipe or mop up the underlying surface to remove the remaining moisture therefrom. The drum 75 is supported by the hanger arms 77 and is operatively coupled with a motor 78 by which it is rotated, the motor receiving its driving current from the generator 35.

Overlying and enclosing the major part of the mop-up roller is a hood 79 which is longitudinally divided to form the two portions 79', these two portions being hingedly joined together at their adjacent edges by the longitudinal hinge

80. The two portions 79' of the hood are attached at their ends to the supporting arms 77 by means of adjusting screws 81, each of which is threadably connected with an arm 77 through a boss 82 carried by the arm and has an end swivelly secured to the adjacent hood portion. Thus when the screws 81 are adjusted, the hood portions may be swung together or apart and normally they are positioned with respect to the absorbent material 76 of the mop-up roller, so that such material will wipe their inner surfaces. The portions 79' of the dryer hood are chambered to enclose an electric resistance heating element 83 which is supplied with current from the generator. Thus the inner surface of the hood is maintained in contact with and functions to dry the absorbent material of the mop-up roller.

At the rear of the carrier there is suspended the transversely extending auxiliary heat box 84 which is closed on its sides and top and has its under side open and in close proximity to the ground surface. Within this heat box is a burner 85 which is supplied with liquid fuel and air respectively through the pipes 86 and 87, the latter pipe being coupled to the outlet nozzle or blower, as shown in Fig. 4. By means of this auxiliary heat box the surface of the roadway or runway of an airport is thoroughly dried after the water has been removed or mopped up therefrom.

The water receiving tank 49 is also connected with the compressed air tank 47 by the pipe 88 so that air may be added to the tank 49 when desired for the purpose or removing the water therefrom.

In the operation of the present machine, it will be readily apparent that the same is moved over the ground surface such, for example, as over a highway or over the runway of an air field by the carrier structure, and the ice and snow over which the heat box passes is melted by the intense heat developed within the heat box and directed downwardly through the open under side thereof. The water resulting from the melting of the ice and snow is guided into the collecting scoop 51 from which it is transferred by the wiper wheel or drum 53 into the trough 52, and the water and slush is then drawn from this trough by the pump 56 and discharged into the receiving tank 49. Following the wiper wheel by which the major portion of the water and slush is picked up, the squeegee unit forces the remaining water from the surface to one side where it may be drained off by the highway or air field runway drainage system. After the squeegee has performed its operation, the wiper roller which is rotated by the driving motor 78 removes further moisture and finally the auxiliary heat box dries off the surface so as to leave it completely or thoroughly dry.

From the foregoing it will be readily apparent that with a machine embodying the present invention, roadways, air field runways and other surface areas may be easily and quickly cleaned or cleared of snow, ice or slush, so that proper use may be made of such surfaces.

While the illustration of the invention has been confined, together with the description, to a ground heating means or a means for effecting the melting of the snow and ice, which is in the form of a liquid fuel burner, it is to be understood that the invention is not to be limited to the use of this specific heating means but that any other suitable heating means may be employed, such for example, as electrical heaters.

What is claimed is:

1. A mechanism for removing snow and ice from a highway or other surface, comprising a carrier adapted to move over the surface, a heat generating means supported by the carrier to be moved over and in close proximity to the surface, a water pick-up unit supported from the carrier immediately behind said heat means and comprising a pair of forwardly diverging wiper arms having contact with the surface, a scoop-like receiver coupling the convergent ends of the arms, a receptacle forming a part of the receiver into which water and slush is discharged, means for effecting the movement of water and slush across the receiver into the receptacle, and means coupled with the receptacle for removing water and slush therefrom and conveying it rearwardly of the carrier.

2. In a mechanism of the character described, including a wheeled carrier and a surface heating unit, means for coupling said unit with the front of said carrier, comprising two pairs of spaced parallel arm members secured to the front of the carrier and extending forwardly therefrom, a pair of vertically disposed elongated yokes each having one vertical side disposed against and secured to the rear of the heating unit, each of said yokes being disposed

between a pair of arms, and a coupling element extending transversely of said arms and connecting the same together and passing through the adjacent yoke whereby the yoke and the pair of arms are joined together for relative vertical movement but are held against relative lateral movement.

3. In a mechanism for removing ice and snow from a highway or other surface and including a wheeled carrier and a heating unit supported thereby for movement over the surface, means for cleaning said surface after the melting of snow and ice thereon, comprising a forwardly and downwardly curving scooping element supported by the carrier in close proximity to the surface, a pair of forwardly diverging wiper arms extending from the scooping element and having contact with said surface for conveying water and slush to the element, means at the rear of the scooping element for receiving water and slush carried over the surface of the element, and means disposed over and cooperating with the said downwardly and forwardly curving surface of the scooping element for moving water and slush over said surface into said receiving means, and means for carrying off water and slush from the said receiving means.

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