THE ROTARY STEAM SNOW SHOVEL.

In our first page illustrations we show the old and the new ways of removing snow from railway tracks. The new way, as accomplished by the rotary steam shovel, has been practically before the public for only a short time, a successful trial of the first machine built in this country having been illustrated in the SCIENTIFIC AMERICAN of May 23, 1885. Perhaps the most common of the old methods consisted in the use of a snow plow, of which there are many forms, attached to the front of a heavy locomotive, the latter itself being sometimes pushed by other locomotives. With all the power it was possible to apply in this way, however, the progress was slow, failures were frequent, and the plow and locomotives would often have to be dug out by gangs of laborers. Many engines have also been wrecked and lives lost by attempting to "buck" a way through snow which had become packed in a cut. The engines would sometimes attack such an obstacle at a speed of fifty miles an hour, so that it has come to be well understood that there was no more dangerous work in the railroad business than that of operating snow plows.

As being better than hand shoveling in such cases, where the snow is sufficiently packed and frozen, a method has been adopted of trenching and cutting out blocks for a sufficient width over the line of track, these blocks to be hauled away by a locomotive to a point where they can be conveniently deposited out of the way. This manner of working is shown in the three views at the top of the page. Pieces of wood are placed around the lower edges of the block, as cut out, to afford a bearing for the lower rope, so that it will not cut through when subjected to the strain of detaching the block from its frozen bedding on the track and ties. Our views are from photographs, showing the cutting and drawing out of these blocks on the Southern Minnesota division of the Chicago, Milwaukee & St. Paul Railway, and on the Winona & St. Peter division of the Chicago & Northwestern Railway.

But by far the most satisfactory method yet devised of accomplishing this work is found in the rotary steam snow shovel, a good idea of the construction of which will be obtained from Fig. 4, while Figs. 5 and 7 show the machine at work.

In the center of the front cylindrical casing of the machine, and projecting slightly into its flaring-edged square hood, is the cone-shaped end of the hub of a wheel which carries the knives and fans. This wheel is mounted on the outer end of a longitudinally extending steel shaft, connected by means of bevel gearing to a cross shaft, actuated by a pair of 17 × 22 inch horizontal steam cylinders. The hub is made in two parts, its inner end carrying a circular plate, near the inner wall of the casing, but not touching it, while spokes extend a short distance from the front end of the hub to a ring, and radial fans or wings extend from the front edges of this ring to the inner disk, to which they are secured. Midway between each two successive fans is a radial shaft or rod, extending from the inner ring, carried by the shorter spokes from the hub, to an outer ring, which covers the front top ends of the fans, and to which the fans are secured. On each of these radial shafts a knife is held to swing, each knife being made with two wings extending at angles to each other, the edges of the knife wings extending radially in line with their respective fans, and resting upon them. Thus, when the cutting edge of one wing of a knife rests against its fan, the other cutting edge extends a suitable distance therefrom to form an opening into the interior of the wheel. By a similar construction, radial shafts or rods extend from the hub to the inner ring, between the spokes, carrying similar, but necessarily smaller, knives and fans, and a less number of them, to operate in the same way.

According as the main operating shaft is rotated, the respective sets of knives and wings open or close in one direction or the other, the snow in either case being acted upon alike, passing into the openings provided, and being forced by the fans out of the spout. The latter is provided with a reversible hood, by which the direction in which the snow is thrown may be changed from one side of the track to the other, or this may be accomplished by reversing the engines, as it would evidently be inexpedient to force the snow in a direction against the wind, and there are many places where it is decidedly advantageous to direct it one way instead of another.

The machine, with the engines and boiler, the latter having more heating surface and a larger fire box than is usual on locomotives, are all mounted on an eight wheeled car, under the charge of a pilot who can, by signals, communicate with the engineers on the rotary and the pushing engines, and by a hand wheel can alter the position of the hood that directs the stream of snow to either side. An ice breaker in front of the front wheels of the front truck is so attached as to maintain a fixed position relative to the wheels, about half an inch above the top of the rail. A flanger is also attached in front of the rear wheels of the front truck, and there are devices by which both the flanger and ice breaker can be instantly raised clear of the track by the pushing of a lever by the pilot, or they will be automatically raised in meeting any unusual obstruction, as in passing switches, etc. These devices effectively supplement the work of the shovel, and are designed to clean the rails as effectually as it could be done by hand with picks, shovels, and brushes: The machine has a weight of some fifty tons, or about that of an ordinary locomotive, and is pushed into the snow by one or two locomotives, as may be desired.

It is obvious that, on account of the great variety of obstacles the machine is designed to encounter, there can be no rule as to the speed of rotation of the wheel carrying the knives and fans. Its action is that of a blower as well as a cutter, and in long sections of track presenting but little difficulty the conditions would be very different from those presented in special places on the line. But this is a matter directly under the control of the pilot, who can regulate the speed of the machine, as well as that of the pushing engines, according to the obstacles presented during every foot of progress. How important this is will be better appreciated, perhaps, by noting the amount and kind of work done by one of these machines last winter, as compared with previous work of this kind, from a report recently published in the Minneapolis *Tribune*:

"One of the rotaries started out in Dakota, in the middle of January, after the terrible storm, and while the thermometer was still 30 degrees below zero. Sidings covered with from 1 to 3 feet of snow were first cleared, the rotary being pushed by one American type engine. The next operation was to open the northern division from Jamestown to Minneawaukon. The first obstacle encountered was a cut filled with 12 feet of solid snow, packed and frozen hard for a distance of abut 25 feet, while for 100 feet more the drift varied in depth from 1 to 5 feet. The rotary was pushed by two 18 by 24 engines, but stalled after penetrating 5 feet into the deep cut. On backing out it was found that the face of the drift on which the rotary cutters had been working resembled polished granite in shine and consistency. The sides of the face were then shoveled down, and the rotary, after repeated attacks, worked through the obstruction. An officer of the company who witnessed the first two trials returned to Jamestown and reported that they would not get to Minneawaukon in six weeks. As many as nine snow plows belonging to the road having been smashed up in trying to open the same cut in the previous spring, it did not seem unlikely that the new machine would also fail. But within three hours the cut was opened, and another cut 500 feet long and varying from 2 to 8 feet deep had also been cleared and an abandoned and buried train had been disinterred. This train was taken back to Jamestown, and the rotary started again next morning, making an advance of 46 miles during the day. Two cuts, 600 and 800 feet long respectively, blocked with snow from 2 to 8 feet deep, were cleared out. In the deepest parts the snow was packed solid and frozen hard. But, notwithstanding this, the worst cut was opened in 50 minutes. On a previous occasion, when this cut was opened by an ordinary snow plow, 35 shovelers were employed, and 11 hours were consumed in opening this cut. It is found that where the snow is not hard packed—of the consistency where an ox can walk on it without sinking in more than 2 inches—the rotary will clear out snow 10 to 12 feet deep while moving two or three miles an hour."

The operation of the machine is described as being a marvelous sight. Such is the tremendous centrifugal force of the wheel, that the snow is discharged in the form of a great stream or cloud, and hurled to a distance of from one hundred to three hundred feet from the track. An army of ten thousand men could not begin to do the work of a single one of these machines within an equal period of time.

This machine has formed the subject of several patents granted to Mr. Edward Leslie, of Orangeville, Ontario, Canada, and is constructed for the Rotary Steam Snow Shovel Company by the Cooke Locomotive Works, of Paterson, N. J. It has been adopted by all the transcontinental lines, the Canadian Pacific having bought the right for their whole system and intending to manufacture the machine in their own shops.

"Almadina" a New Gum.

Under the various names of "almadina," "potato gum," "euphorbia gum," or, more shortly, "E. G.," a peculiar resin of African origin has been of late years gradually finding its way to the European drug markets in steadily increasing quantities. Hitherto its chief if not its only use in the arts has been as a "substitute" for or addition to India rubber, and we learn it is not only much cheaper than caoutchouc, but actually improves the latter when added to it in certain proportions. Among the advantages over pure caoutchouc which mixtures thereof with "E. G." are said to possess, not the least are diminished porosity and greater durability.

MESSRS. D. F. Dunn & Co. (not B. F. Dunn & Co.), of Columbus, Ohio, manufacture the patented valve dresser noticed in our issue of March 17, and they write us that they are already receiving many inquiries therefor.

Correspondence.

The Uses of Glycerine.

To the Editor of the Scientific American:

Few people realize the importance of the uses of pure commercial glycerine, and how it can be used and made available for purposes where no substitute is found that will take its place; and herein, Mr. Editor, if you will allow me space in your well-read journal to speak of its utility, no doubt many of your readers will find an opportunity to thank you. As a dressing for ladies' shoes nothing equals it, making the leather soft and pliable without soiling the garments in contact. Where the feet sweat, burnt alum and glycerine—one of former to two of the latter—rubbed on the feet at night and a light or open sock worn, the feet washed in the morning with tepid water, will keep them during the day free from odor, so disagreeable to those persons who are sufferers.

For bunions and corns Cannabis indicus and glycerine, equal parts, painted on the bunion or corn and bound around with Canton flannel, adding a few drops of the liquid to the flannel where it comes in contact with the affected parts, will soon restore to health.

As a face lotion, oatmeal made in a paste with glycerine 2 parts, water 1 part, and applied to the face at night, with a mask worn over, will give in a short time, if faithfully pursued, a youthful appearance to the skin.

As a dressing in the bath, 2 quarts of water with 2 ounces of glycerine, scented with rose, which will impart a final freshness and delicacy to the skin.

In severe paroxysms in coughing, either in coughs, colds, or consumptives, one or two tablespoonfuls of pure glycerine in pure rye whisky or hot rich cream will afford almost immediate relief; and to the consumptive a panacea is found by daily use of glycerine internally, with the proportion of 1 part of powdered willow charcoal and 2 parts of pure glycerine.

For diseased and inflamed gums, 2 parts of golden seal, 1 part of powdered burnt alum, and 2 parts of glycerine, made in a paste and rubbed on the gums and around the teeth at night, strengthens and restores the gums to health, provided no tartar is present to cause the disease, which must be removed first before applying.

And finally, Mr. Editor, to the epicure who relishes a nice breakfast dish of fried fish, he will find "a feast for the gods" by frying the fish in glycerine to a brown, adding a small sprig of parsley when nearly done.

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Long Distance Telegraphy.

The recently announced claim of a telegraphic circuit of over six thousand miles, surpassing all previous experiments, is somewhat misleading. Many efforts at long circuit work have occurred during the past few years, the distance varying from 4,600 to 8,100 miles.

It is a matter of considerable pride to the old operators of the Western Union Telegraph Company in San Francisco, says the San Francisco *Alta*, that the feat of transmitting clock signals through 7,200 miles of line and communicating directly through that same line has never been equaled. The occasion of this feat was the telegraphic determination of the difference of longitude in time between the United States coast survey station in San Francisco and the observatory of the Harvard University at Cambridge, in the year 1869. In order to determine the time of transmission of a signal either from the clock or from the operator's key over the given length of the line of 3,600 miles, three different methods were devised. One of these was original with Prof. George Davidson, who had charge of the observations. Through the liberality of the management of the Western Union Telegraph Company, a double circuit of line was looped at Cambridge, so that there extended from the San Francisco observatory 3,600 miles to Cambridge, and the return from Cambridge by a somewhat different route of nearly equal length. The two "earths" were under the San Francisco observatory, distant from each other not more than ten feet. The line was first opened by an operator in the observatory, and when the fast connection was made at Cambridge, the San Francisco operator was considerably astonished to get his own message back within one second of time.

Then the astronomical break circuit clock was thrown into line, and made its first break on a pen recording upon a revolving cylinder of paper in the San Francisco observatory, and after this break had traversed the line to Cambridge, it returned and made a break upon a second pen moving parallel with the former, in about eight-tenths of a second of time. This was continued every second for several minutes, and was repeated upon several nights, and when one of the twelve batteries in this long circuit was removed, the wave length time was reduced to only sixty-five hundredths of a second. Communication was, of course, carried on at the same rate of speed. This feat over a line 7,200 miles in length has been unrivaled up to the present time, both as a practical working exhibit and a scientific success.