FIGHTING SNOW ON THE RAILROADS OF THE NORTHWEST.

The past winter proved to be the most trying in the history of the railroads of Dakota and Minnesota, both in respect of the enormous quantity of snow that fell at any given time and the unprecedented length and frequency of the storms. Those of our readers who live east of the Mississippi have but a faint idea of the heroic struggle which is made during a winter of heavy snows to keep open the railroads between the various cities, and maintain the lines of communication between East and West by way of the great transcontinental railroads.

We have received from Mr. E. W. Hadley, of Santa Barbara, California, a graphic description of his former experiences when, as division superintendent, he was "fighting snow" on one of the great Western railroads. The accompanying illustrations are reproduced from photographs taken by Mr. H. Steinhauer, of Groton, South Dakota, after the great blizzards of last winter. Mr. Hadley writes as follows:

The Dakotas, Minnesota and northern Iowa are the haunts of the blizzard and the home of the Storm King. The windswept prairies of Nebraska and Kansas, level as a billiard table, while trying enough in midwinter, do not possess the essentials of a great snow country. The general contour of Dakota and Minnesota is rolling—sufficiently so that on many of the railroad lines cut succeeds cut, with an average, on many of the worst portions, of ten to the mile. For a long term of years the writer, as division superintendent, presided over the destinies of the "chain gang" on several hundred miles of the Dakota and Minnesota lines of one of the largest Western railroads, spending some six or seven months out of the twelve in a ceaseless battle with snow. I do not think I can give a better idea of this species of war—for it is nothing less—than by describing a snow bucking expedition in the midst of the winter campaign. Like "the days of old, the days of gold, the days of '49," these days will come no more. The advent of the "rotary" has robbed the blizzard of its dangers and has added many thousand dollars to the capitalized valuation of the Northwestern lines.

Winter commences in the far Northwest in September, and with no uncertain sound. The writer has seen water pipes within the brick walls of a steam heated building frozen solid on the twenty-fifth day of September, and was unable to lay up his snow plows until past the middle of the following May. The latter end of summer in the shops and roundhouses at division points is devoted to putting in trim the snow fighting outfit. Engines are overhauled, plows buckled on, "flangers" and "white wings" got ready; the lists of engineers and conductors are carefully scrutinized and those of most experience, or better fitted for the service, told off to run plows and "drag-outs." Let us skip the opening skirmish, however, and get into the thick of the fight. The superintendent surveys the yards from the watch tower of his office, and listens with a sense of its restful hum to the ceaseless click of the instruments in the next room. The connecting door opens, the chief dispatcher looks in long enough to say that Mandan or Medicine Hat has just reported a blizzard coming up. Now Medicine Hat is the weather-maker of the Northwest. The genuine blizzard is born there and comes thence a thousand miles to pile up the snow on your own particular track.

Again the door opens and the watchful dispatcher announces that "Medicine Hat says blizzard getting worse." Without, everything is brilliant sunshine and trains are all on time, but the cautious superintendent goes to the 'phone, calls up the roundhouse, and tells the foreman that he had better "put a fire in 321 and a couple of the lighter plows." A few hours pass—a subtile change comes over the weather—the sun doesn't seem to shine quite so brightly—there is a trifle of haze in the air. Suddenly there is a quick change of scene. The sky grows dark and leaden colored in the northwest; the thermometer drops a few degrees and there is a trace of fine snow in the air. The last act comes on quickly; with a rush comes the howling wind out of the Northwest, filled with fine snow, and where, but a few hours before, the sun was shining the blizzard now rages in full force. The wind is a hurricane of forty miles an hour, and the air is so full of snow that it is impossible to see the length of a telegraph pole. Now all is hurry—the superintendent takes up his quarters in the telegraph office, and together he and the dispatcher watch the progress of the few trains still out upon the road and devise measures to get them under cover. No. 1, the night express, which left the southern terminus of the line several hours before, has run into the blizzard and is making slow progress. She left Colgate a full hour ago, but has not yet shown up at Pinto, the first station north, although her running time between the two is about twenty minutes. Pinto here calls up the dispatcher and ticks off a message from the conductor of No. 1, who has just walked in, announcing that his engine blew out a cylinder head three miles south of Pinto—that she is short of water, and that he has "killed her." In swift succession orders are sent to hold at terminal points two branch line passenger trains now due to leave, and an order is sent to Hooker, and engineer of plow engine 119, which has been held in reserve at Fairmount, to run to Pinto, and flag from there to where No. 1 is stalled and try to get her out. The chances of getting out No. 1 before midnight look very slim, and the conductor of No. 1 is instructed to hire any available sleighs at Pinto, load them with fuel and provisions, and get back to his train. This order had hardly been got off the line before the wire goes down and all communication is shut off. Now comes a period of forced inaction which grows many a gray hair in the superintendent's head. What of the two hundred or more passengers on No. 1—the women and children out on the trackless prairie exposed to the full force of the blizzard? What of the carloads of cattle and horses on the first section of No. 17?

There is nothing to be done in the way of sending out additional plows, however, until the blizzard shall have blown itself out, but the superintendent finds a vent for his activity in preparing for the coming fight. Getting on his buffalo overcoat and snow boots, he visits the roundhouse to see that everything is in perfect readiness for an attack on the snow as soon as the blizzard shall have let up. He sees that plow engines are abundantly supplied with oil, tallow, waste and steam hose—that water cars are cleared of ice and filled, and that a couple of box cars equipped with stoves, tables and chairs are loaded with provisions. Engine and train crews are notified to keep within instant call, and messengers are dispatched to gather an army of snow shovelers. Toward morning of the third day the superintendent is awakened by the caller, who hands him a message from the night dispatcher advising him that the blizzard shows signs of dying down. It is welcome news, and a few minutes more finds him at his office ready for the start. The dispatcher has not been idle, and by the time the blizzard shows signs of dying down the yard is full of snow equipment. Two heavy freight engines, each carrying heavy iron plows, stand coupled to cabooses ready to be launched against the drifts on two branch lines. The outfit for the main line is a more ponderous one. An immense Congdon plow, faced with wood and shod with steel, is backed up by two 17 by 24 engines, the pilot having been removed from the rear one so that it may be coupled up close. The face of this huge plow rises almost to the top of the engine stack, and in order that some view ahead may be obtained, a small cupola has been built upon top of the engine cab in which the conductor may ensconce himself and thus be enabled to direct the engineer. On the main track, a few rods behind this immense plow, stands the drag-out, a 19 by 26 ten-wheeler, coupled to which is a train made up of three or four coaches, the cooking and provision cars before referred to, a water car, a coal car, and the conductor's caboose. The coaches are filled with a crew of two hundred navvies equipped with shovels and scoops.

The wind has now almost completely gone down and the thermometer has fallen to thirty-five below. All of the men moving around wear shaggy fur overcoats, fur caps and felt boots an inch thick. Nothing but the matted hair of the buffalo, a native of these barren prairies, will withstand this intense cold. The gray dawn comes on apace, and with it comes the conductor of the plows with the yellow copies of his orders fluttering in his hand. He climbs aboard. There is a shrill blast of the whistle, repeated by the second engine, and the plow is off. If you are now in the cab of the forward plow engine, climb up on the fireman's side, brace your feet against the front end of the cab and the fireman will hand you a small piece of greasy waste. You can keep the frost off the window and gain a glimpse ahead. The engineer opens her up a little and we strike a thirty mile gait. Nothing in sight but the boundless prairie looking like a frozen sea.

And now the engineer, without waiting for an admonition from the conductor, slows down, for he knows that he is close upon a long curving cut that should be full of snow. Running up close to the beginning of the cut, he makes a full stop, and conductor, superintendent and roadmaster unbuckle the snow curtains, get out and walk ahead to have a look at it. A peculiarity of drifts in these high latitudes is the solidity with which the tremendous wind pressure packs the snow. The crystals are small and angular, like meal, and the driving wind presses and fits them together with a solidity that is but little short of ice.

The long, shallow approach to the cut is the most dangerous part of it, for there the snow is sure to be hardest and the depth is not sufficient to insure the plow staying on the track. While there are a hundred dangerous chances in bucking snow anywhere, good judgment demands that they should be minimized as far as possible, and the roadmaster is therefore sent back on the run to hustle out his force. Getting within hailing distance of the drag-out, which has now come up, his stentorian voice and waving arms quickly bring to the front a force of husky snow shovelers, whom, with the tact of a general disposing his forces, he soon has scattered over the snow drift, some shoveling away the shallow snow and putting a "face" on it, as it is called, other parties cutting trenches across the drift in its deepest parts. The drag-out is now ordered back out of the way and the plow gets back a few miles in order to gather momentum for a run. In all these operations time is at a heavy premium, for every hour that the road is blockaded means a heavy financial loss. Standing upon the highest point of the drift, the burly roadmaster urges on the efforts of his men with hoarse shouts and commands.

Away from the distance comes the piercing whistle of the eager plow, announcing that she is ready. The roadmaster gives a final glance at the face of the cut to see that it is properly undercut so as to hold down the nose of the plow, then climbs to the highest spot and signals that he is ready. Now, if you are perched on the fireman's seat, you begin to get a realizing sense of the delights of flight. The throttle is wide open and the engineer is giving her notch after notch. If you are an old hand at the business every consideration of fear is swallowed up in the intense excitement of the mad rush; but if you have never ridden behind the plow before, there comes over you a sickening sense of utter helplessness and a strong realization of the grim nature of the work. But sixty or seventy miles an hour quickly cover the few miles of race track, you catch a glimpse for a second of the lines of navvies on either side of the cut and then plunge into complete darkness! You feel as if you had dropped into deep water; the engineer throws her forward into the company's notch, and with almost human struggles and efforts you feel the tremendous machine pushing her way through the snow. As she strikes trench after trench, the wheels take a fresh hold upon the clear rail and the plow plunges forward a few feet further; but at last, with a final whirl of the drive wheels, you come to a full stop. The engineer pushes back the sliding sash on the side of the cab, and with a gasp of relief you find that you are about on a level with the top of the drift, and crawl out of the window to find the plow almost completely buried in snow. The drag-out has followed up close behind, and the roadmaster has every available man hard at work digging away from around and behind the plow.

Now the ponderous ten-wheeler is brought up, and proceeds by main force to drag the plow out of the drift. Hardly does she clear the cut before the shovelers are driven thick into it to put a new face upon the drift and carefully clear the rails leading up to it, ready for new run. Back again toward the horizon, this time to a distance of five or six miles, goes the plow. This time you watch her as she comes out of the distance like a black speck, growing rapidly in size, and as she picks up a few shovelfuls of snow, throwing it off the plow in graceful curving rainbows. With a hoarse scream she dashes into the cut, and for an instant it appears as if a mine had been exploded under the drift. The snow is at first thrown high in air, but as she loses speed, it is rolled out of the cut in immense masses weighing tons. For an instant it looks as if she would be stuck again, but the drift has been skillfully trenched, and with the renewed impetus gained from a few feet of clear rail, she dashes through the diminishing drift, and with a growing feeling of confidence you start ahead for the next struggle.

The next serious cut is four hundred feet long, ten feet deep for some distance in the center and full of the hardest snow. It is critically examined and probed with a bar to detect any stratum of ice which might run through it, and it is decided to trust to a long and hard run to get through without spending time in trenching it. The plow is sent at it with a will. But the cut is deep and narrow and the snow hard packed. It is like running into a stone wall. Although shot at it at a speed of sixty-five miles an hour, the plow stops with a mighty shock in what seems to be her own length. The snow bursts in the cab windows and comes pouring in like an avalanche; the tons of coal in the tender can no longer be restrained, but break the gate and are hurled against the boiler head. The cab is filled with escaping steam and falling glass, and you seek wildly for some means of escape. Again the plow is dug out, the snow shoveled out of the cab, boards nailed over the windows, and the engineer, tying a handkerchief around his forehead to stop the flow of blood from the cuts made by the broken glass, sounds a retreat, but with a grim determination to "put her through this time or break a steam pipe."

And so the fight goes on day after day—it may be ten days before the line is again open to traffic. The dead engines are found and resuscitated—their crews having found a refuge in the nearest farmhouse. The passenger train is discovered completely buried in snow with a fence board stuck in the engine stack to indicate its grave. The train crew have managed to keep their passengers from starvation or freezing by drawing on the scattered farmhouses for provisions, and by using the coal from the tender of their dead engine to keep the cars warm. The broken telegraph line is found and repaired, and the superintendent's first message sets other plows at work from the southern terminus. The two outfits finally meet, and with triumphant whistles and a few brief words of congratulation, the snow bucking expedition is over.

The fight has resulted in a victory of brute strength

over the elements, and that is always a costly proceeding. Fifty dollars per mile of main track is the usual estimate for keeping the line clear of snow during the year, but of course in many instances the figure is much higher. This amount also is intended to cover merely the direct cost of removing snow, but does not by any means reach the indirect loss through damage to motive power and rolling stock, and by loss of traffic.

The narrator had just returned from a ten days' snow bucking expedition, when the first rotary which had been brought to the Northwest was turned over to him. With feet still wrapped in bandages from the effect of frost bites, he painfully climbed from the plow into a comfortable chair in the front end of the rotary, and memory still brings back the sense of complete triumph and deep satisfaction with which, from this comfortable position, he saw this "whirling wheel of fortune," as the machine was instantly dubbed by a quick-witted conductor, hurl his ancient enemy in a snowy Niagara high in air and beyond the right of way. But yet he was obliged to confess that while snow bucking, with a rotary, had lost almost all of its discomforts, it had at the same time deprived him of a source of keenest enjoyment.

The Annual Battle with Insects.

BY GEORGE ETHELBERT WALSH.

The protection of our common birds from ruthless destruction assumes a new importance in the eyes of many, now that special attention is drawn to the great economic value of these creatures by the Department of Agriculture. It is estimated that about $100,000,000 are saved to the farmers of the country by the birds; and if this is true to-day, what must have been the case fifty years ago? We had ten song and field birds then to every one that is now in existence in this country. Insect life has been steadily multiplying in direct proportion to the slaughter of the birds; and with the disappearance of every species of birds there has come into existence new insects that help to make agriculture more uncertain and precarious.

Our birds were the appointed guardians of our crops in field, forest, and garden. Most of them depend for a living upon insects, vermin, and rodents. When Audubon stated that the woodcock would eat its weight in insects in one day, he merely called attention to the general omnivorous habit of most of our insectivorous birds. They are all great insect destroyers.

For a quarter of a century science has been laboring in the cause of agriculture to reduce the number of garden pests and to hold them in check. The annual battles with the insect foes are carried on energetically from early spring until late autumn; and the farmer or gardener is never quite sure of his crops until they have been actually harvested. In spite of all the protective agencies that science has surrounded the fields and gardens with, disasters of gigantic proportions will break out occasionally through the sudden growth of some species of obnoxious insect or fungous growth.

It is the destruction of the potato crop one season by the Colorado beetle; the total failure of the wheat yield in certain States by the rust or blight another year; or the widespread injury to the cotton plants by the boll worms. Somewhere within the United States some crop is pretty sure to be seriously damaged by the insects or fungous growth nearly every season.

An idea of what this annual battle means to the farmers can be faintly appreciated by examining some of the common insect pests that regularly appear in our gardens and fields. Spring has barely opened before the first foes appear. Usually in our Northern and Middle States the currant worms are the first formidable enemies to appear in numbers. These appear early in June and sometimes late in May. The saw-fly weeks before this has deposited its eggs on the gooseberry and currant bushes; and from these eggs emerge the deadly and destructive currant worms. Before the fruit has set they will completely defoliate the bushes, unless the farmer energetically sprays them with hellebore in kerosene emulsion—the best remedy so far devised.

An early, and two subsequent, sprayings of this emulsion must be made to save the currant and gooseberry bushes. While work is in progress on the currant bushes, the cherry and plum trees will be attacked by their most formidable foe—the plum curculio. The cherry trees do not suffer so severely from the curculio as the plum. All sorts of remedies have been tried and suggested for this tough little insect; but so far nothing has been found that will kill the curculio that will not also destroy the foliage of the trees.

A peculiar habit of the curculio has been discovered, however, which enables the farmer, with a little labor, to capture it. When a limb is jarred, the curculios roll up and drop to the ground, feigning death. If not disturbed in the grass, however, they very quickly recover their normal activity and return to their work. By spreading white sheets under the trees and by jarring the limbs with a long pole, the farmer can very easily collect a crop of the insects and burn them. To avoid doing injury to the trees, the poles are shod with a piece of rubber, which can strike against the limbs and not cut the bark.

The codling moth comes next upon the scene. The moth begins active operations on the apple trees before the blossoms have fallen, and it is at this season that the farmer must begin spraying for them. The curculio has not been disposed of by any means before the codling moth appears on the trees. The two must be fought at the same time. The apple trees must be sprayed with London purple just as soon as the petals begin to fall, and a second spraying should be administered in two weeks or less. As the codling moth may also appear on the pear trees, it is safer to spray with the same mixture.

The grapevines are subject to attacks from anthrax early in the season, and they must be swabbed with a solution of copperas, one pound to ten gallons of water. Later the Bordeaux mixture must be applied to prevent fungus spores from lodging on the vines. This is applied before the blossoms appear, and twice thereafter at intervals of ten to twelve days.

The apple and pear trees are liable to be attacked by anthrax or the scab, and the same celebrated mixture is used on them too. Where the scab appears on the bark in large blotches, the bark is scraped with a dull knife and washed with a kerosene emulsion and Bordeaux mixture.

The aphis and hop louse abound in great numbers on many trees and vines. They kill all the new growths of the cherry and plum trees, and later they swarm on the rose bushes. Their growth must be checked early in their career. This can be done generally by spraying them thoroughly with a strong kerosene emulsion.

Next come the potato beetles, and, if the potatoes have not been soaked in corrosive sublimate before planting, the scab will ruin the crop. Paris green is the celebrated remedy for the potato beetle. Fire rot appears on the blackberry and raspberry canes in June, and there is no remedy for this except to cut out the affected parts and stimulate the growth of the plants. The plum knot and peach yellows are the great summer foes that try the patience of farmers and baffle the ingenuity of scientists. The former is a fungous growth which appears early in June, but the spores of which are sown in September of the preceding year. The plum knot must be cut out with a knife in the spring and fall. In New York there is a law compelling all farmers to cut out the plum knot, under severe penalty. The knot must be burned immediately. When trees are covered with the knot, the best way is to cut them down and burn every part of them.

The peach yellows is also a fungous growth; and, like the plum knot, the most effective way is to cut it out and destroy it by fire. Liberal applications of the Bordeaux mixture sometimes prove a remedy for the yellows. The yellows cause enormous losses to the peach growers of the Delaware peninsula.

By the middle of summer insect foes are swarming all over the garden and on every plant. Plant lice or aphides attack all weak plants, and they multiply at the rate of five to twenty millions in a season from one progenitor. The red spiders appear in dry seasons, and the scale insects attack the bark and fruits of many trees. Scraping the trees and applying a wash of kerosene emulsion is the best remedy. The slugs of pear and apple trees must be treated to an application of hellebore. The rose bug and flea beetle must be attacked with the arsenites. The tomato rot seems to be invincible, and the squash bugs can only be destroyed by picking them off. The grub of the corn and cabbage fields is likewise a bad foe to deal with. The birds are its most formidable foes.

These are only some of the most common and formidable foes the farmers have to contend with in the summer season. Others appear at special times and in special localities. It would require a volume to write of all of them. The poisons used for remedies have been tried and recommended by the Agricultural Department, and every owner of a piece of garden land ought to be able to mix them at home.

The Bordeaux mixture is made of six pounds of copper sulphate, four pounds of lime, and twenty-five gallons of water. This is a strong solution, and a weaker one can be made by reducing the quantity of copper sulphate and lime.

A kerosene emulsion is made by mixing thoroughly one gallon of kerosene, one-half pound of good soap, and half a gallon of water.

London purple mixture is composed of one-eighth of a pound of London purple to twenty-five gallons of water. The same formula applies to Paris green mixtures.

A wash for scale insects is made of twenty pounds of resin, two and a half pounds of caustic soda to twenty-five gallons of water.

MANY spiders use their rope-making power in seizing their prey. They not only stab and poison their victim, but tie it, wing and leg, rapidly throwing over it coil after coil of sticky ligament, which soon not only render it helpless, but convert it into a mummy, thoroughly wrapped, and not only easy to carry, but put up for preservation, should the spider not desire an immediate meal.

Science Notes.

Prof. W. Crookes will be nominated as president of the British Association for the Bristol meeting of 1898.

The American X Ray Journal is published at St. Louis. The first number has just appeared. It is edited by D. Heber Roberts.

The Physikalish-Technische Reichsanstalt is now using carborundum crystals to a great extent to replace diamonds in the production of finely divided scales, says the Electrician. Small flat hexagonal crystals are chosen of from half to one mm. side and mounted in a steel holder by means of a drop of shellac. The lines are said to be much more even than those produced by a diamond; they have been examined when magnified fifty times and found to be still sharply defined.

Mr. Clement E. Stretton, the general secretary of the National Railway Museum Association, speaking of his letter which was published in the SCIENTIFIC AMERICAN for May 29, says that the total number of English engines sent over was practically one hundred. He said that ninety-nine are certain, and probably one hundred and one is more correct. He is at present investigating the history of the two doubtful engines in order to settle the question in a satisfactory manner.

Efforts are being made throughout the State of New Hampshire to preserve Mount Washington from the lumber company which recently purchased it for $100,000. The State makes no provision for the preservation of the forests, but the Appalachian Club at its next meeting will endeavor to induce the State to make a law which will cover the case. It is said that, if the lumber company is not restrained, the highest and best known peak in the East will be totally stripped of all verdure.

Two medical biographies of considerable importance have just appeared. The first is the "Life and Times of Thomas Wakley," by S. Squire Sprigge. Wakley is principally remembered as the founder of the London Lancet, but he was also celebrated as a politician in the best sense of the word, and his efforts in the cause of medical reform were eventually successful. The other work is "Vita Medica: Chapters of Medical Life and Work," by Sir Benjamin Ward Richardson, M.D., LL.D., F.R.S. In this volume, which was completed before his death, the author has given varied chapters on his memories of the last sixty years, with descriptions of some of the ideals he formed in the course of a long professional life. The book includes a considerable number of essays treating of personal observations and on subjects in the domains of science and philosophy.

It is bad enough when private individuals get in the hands of charlatans, but it is certainly difficult to think there exists not only private persons but public bodies who put more trust in the wild assertions of the charlatans than in the matured conclusions of science. The latest instance of gullibility, says Nature, comes from Bedfordshire, England. The local government board of a town wished to secure a water supply and they unanimously resolved to employ a water diviner. This gifted gentleman was employed, and the district counsel applied for a loan to carry out their plans, but fortunately the government auditor refused to audit the accounts. A boring of 700 feet had been made at this time and no water had been obtained. The auditor said it had been held that "the pretense of power, whether moral, physical, or supernatural, with intent to obtain money, was sufficient to constitute an offense within the meaning of the law," and he therefore thought that, as the diviner claimed to exercise some such power, his employment was clearly illegal, and the amount of his fee would be disallowed and the gentlemen who authorized the payment surcharged with it. The decision ought to materially reduce the number of believers in alleged divining rods, mineral rods, etc. This evil is as rife in our own country as in England.

Before deciding on the system of illumination to be adopted for a new girls' school in Vienna, the authorities invited firms experimentally to fit nine of the schoolrooms with lamps, says the Trade Journals Review. This request was responded to, photometric measurements were made, the cost question entered into, and a well attended conversazione held in the rooms. The Zeitschrift des Oesterr. Ingenieur und Architekten Vereins gives a plan of the rooms, with the positions, power, etc., of the lamps, and particulars respecting consumption of gas, or electricity, cost of maintenance and installation, etc. The diagrams and tables occupy one page of the journal. A great deal of information is offered in the most condensed state, but more explanatory notes would be desirable. The photometric tests were made after Weber and after Kauer. The committee have come to the conclusion that the lamps, incandescence, electric or gas lamps, should not be directly seen, but that diffused light should be applied, and that the lamps should be suspended 8½ feet above the desks, which in the rooms in question means about 3¼ feet below the ceiling. The installation of the electric lamps was considered cheaper than that of gas lamps, but the incandescence gas lamps would prove more economical to maintain.

SCIENTIFIC AMERICAN

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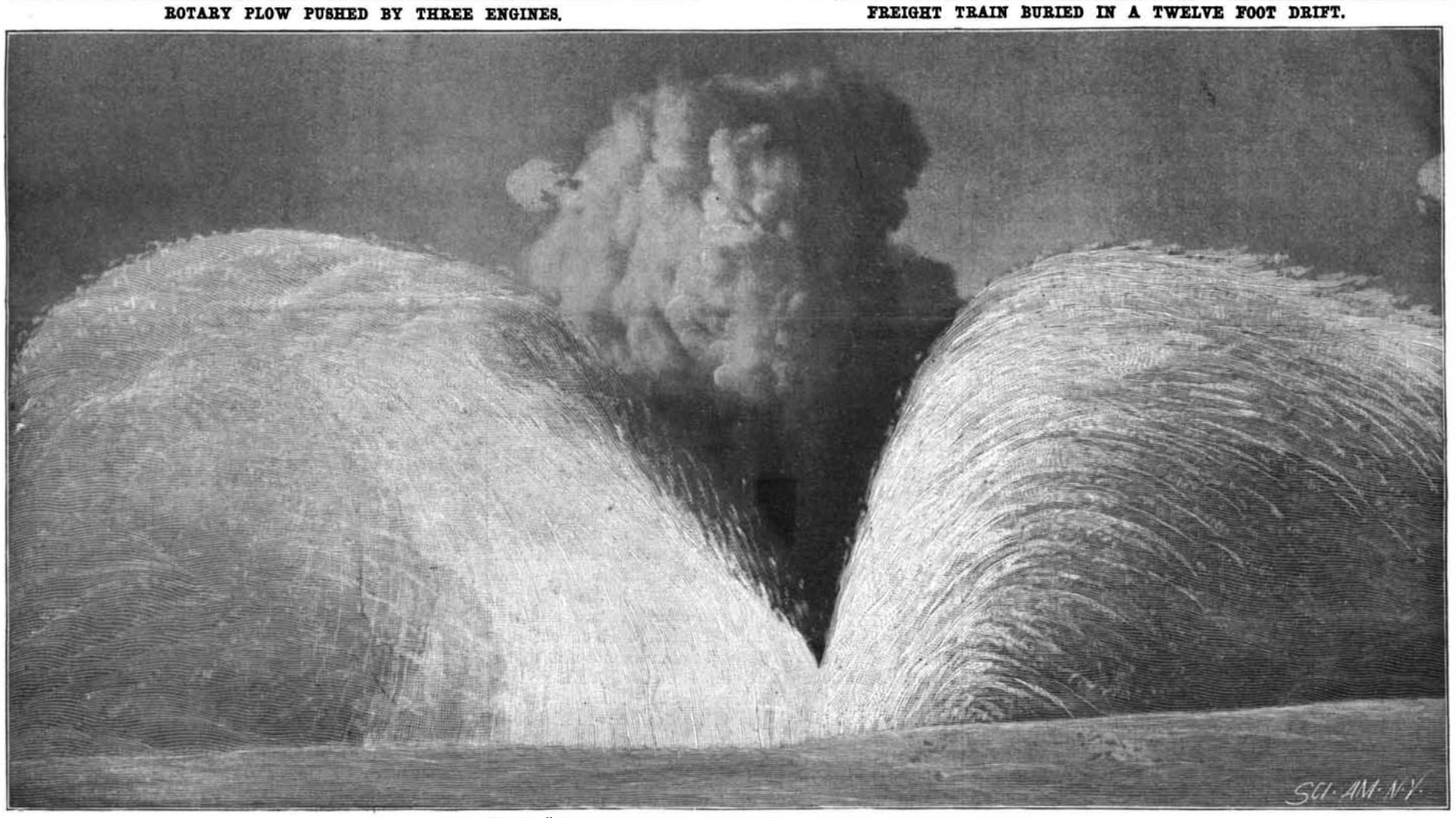
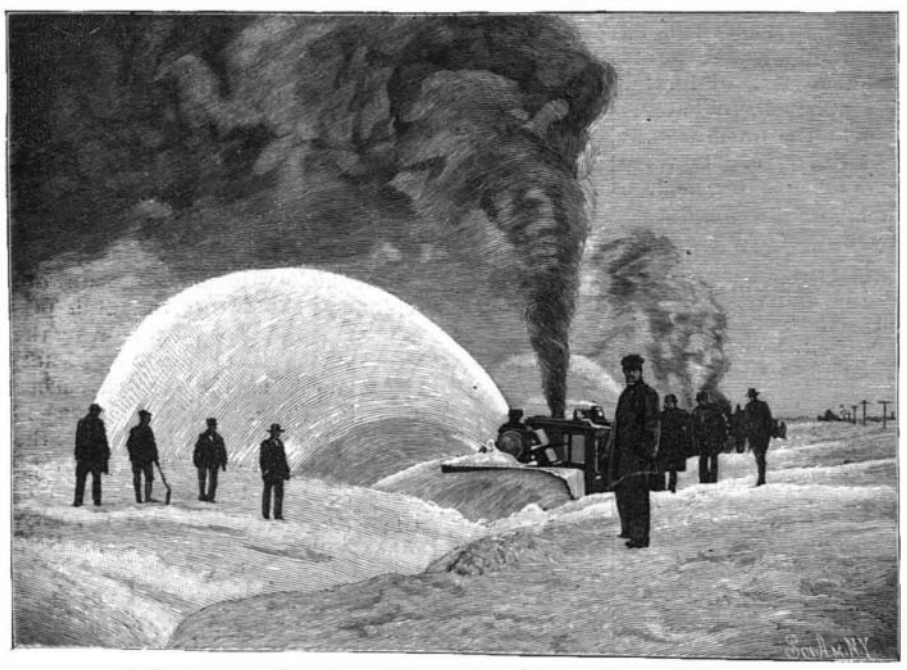
ROTARY PLOW PUSHED BY THREE ENGINES.

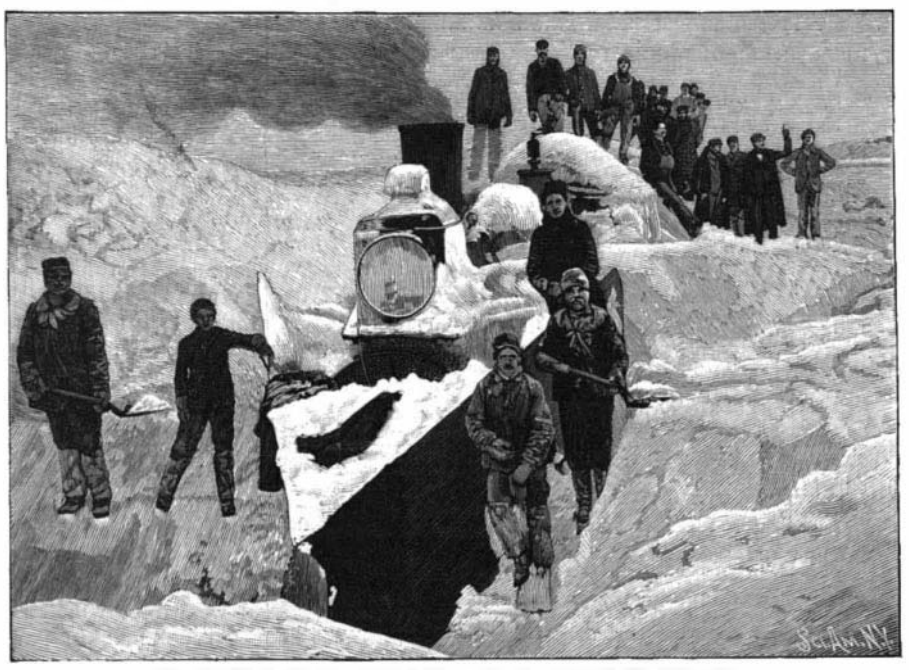
FREIGHT TRAIN BURIED IN A TWELVE FOOT DRIFT.



OLD STYLE "SNOW BUCKER" STRIKING A DRIFT AT FULL SPEED.



ROTARY CLEARING CUT THREE-QUARTERS OF A MILE LONG.



DIGGING OUT THE ENGINE OF A FREIGHT TRAIN.

FIGHTING SNOW ON THE RAILROADS OF THE NORTHWEST.—[See page 22.]