# Burning Coal, Which "Cans Coolness," Is the Latest Weapon Against Heat

## Government Is Testing Remarkable Indoor Blizzard Producing Appliances Which Will Keep President and Congress Comfortable in Summer's Oppressiveness.

By John Elfreth Watkins.

"SIZZARDS," like his satanic majesty, can best be fought with fire. This the physicists of Uncle Sam are proving by a series of experiments, just now most seasonable, timely and apropos. They are banishing heat with flame—are burning coal to produce cold. And, incidentally, they are discovering that it requires more coal to cool rooms than to heat them.

Paradoxical as all this may sound, it is none the less true. I have just spent half a day with the men who are doing this interesting work—developing the fine art of keeping cool.

My attention had been called to this enterprise by the announcement that $72,000 was to be expended in cooling the Senate and House wings of the Capitol at Washington by a system under investigation at the National Bureau of Standards, and to this great institution I hied myself, to be received by Dr. Samuel W. Stratton, the director. Immediately he had me ushered in to Professor Edward B. Rosa, the chief physicist of the bureau.

Beads of perspiration stood out upon my brow when I entered Professor Rosa's domain, and my collar was wilted, while my cuffs were fast melting. But the physicist invited me into a room where the climate was as salubrious as a balmy day in mid-October. Here I proceeded to wax cool and inquisitive.

An ermine mantle of snow covered a radiator against the wall, and against this coil of pipes—like the steam radiator which heats us in winter—an electric fan was blowing its breath, which came off chill and bracing. The windows were down to keep out the draft—the hot draft, be it known, the enervating, debilitating fumes of midsummer.

A big cooling stove set up in another room was, with contented purrings, gobbling up heat and breathing out cold at a rate which would make a polar bear dance with glee. In still another room I saw a young physicist watching a hydrometer and thermometer that were receiving the air which an electric fan was pumping over two huge cakes of ice that stood in a big metallic tub.

### HOT ROOM FOR BLIZZARDS.

And from here I went into the stifling hot room, where they actually manufacture this cool weather that is kept on tap in the rooms above.

You would think that this work of churning up indoor blizzards was a cool task and a comfortable one this sizzling weather, but you are wrong; dead wrong. Old Horny himself cannot occupy a sanctum much more uncomfortable than this modern cave of Aeolus, whence is distributed the cool weather which puts vigor in the bone, blood and sinew of Professor Stratt n's staff of scientific assistants. Or, at least, into such of them as are fortunate enough to be engaged in work requiring a cool atmosphere, for, remember, the system is intended to benefit the work, not the workers.

And yet, while my collar and cuffs were again melting, down there in this shadowy Tophet Professor Rosa did nothing less than step up to the engine cylinder, scrape off some pure and virgin snow, roll it into a ball, and proceed to munch it with the satisfaction of an urchin who tastes winter's first layer of good sledding. So this white engine cylinder, which masqueraded in the guise of an asbestos packing, had, in reality, a snow covering just as bona fide as that which Peary "negotiated" upon the utmost tip of this old spinning top upon which we buzz and bustle through celestial space.

It is far too hot for me to describe, or you to ponder over, the details of this machinery, for neither you nor I sit ensconced amid the salubrity of manufactured autumn breezes or mountain zephyrs. In the good old days when you watched Dinah salt the ice cream freezer and wondered why you went to sound the paternal oracle and learned some elementary physics—among other things the law that a solution of salt and water requires much greater cold to freeze it than just plain water out of the old pump. And this little simple law is very important in all this modern art of manufacturing cool weather indoors. Substitute cold water for hot water in the radiators of your house and you cool your house instead of heating it.

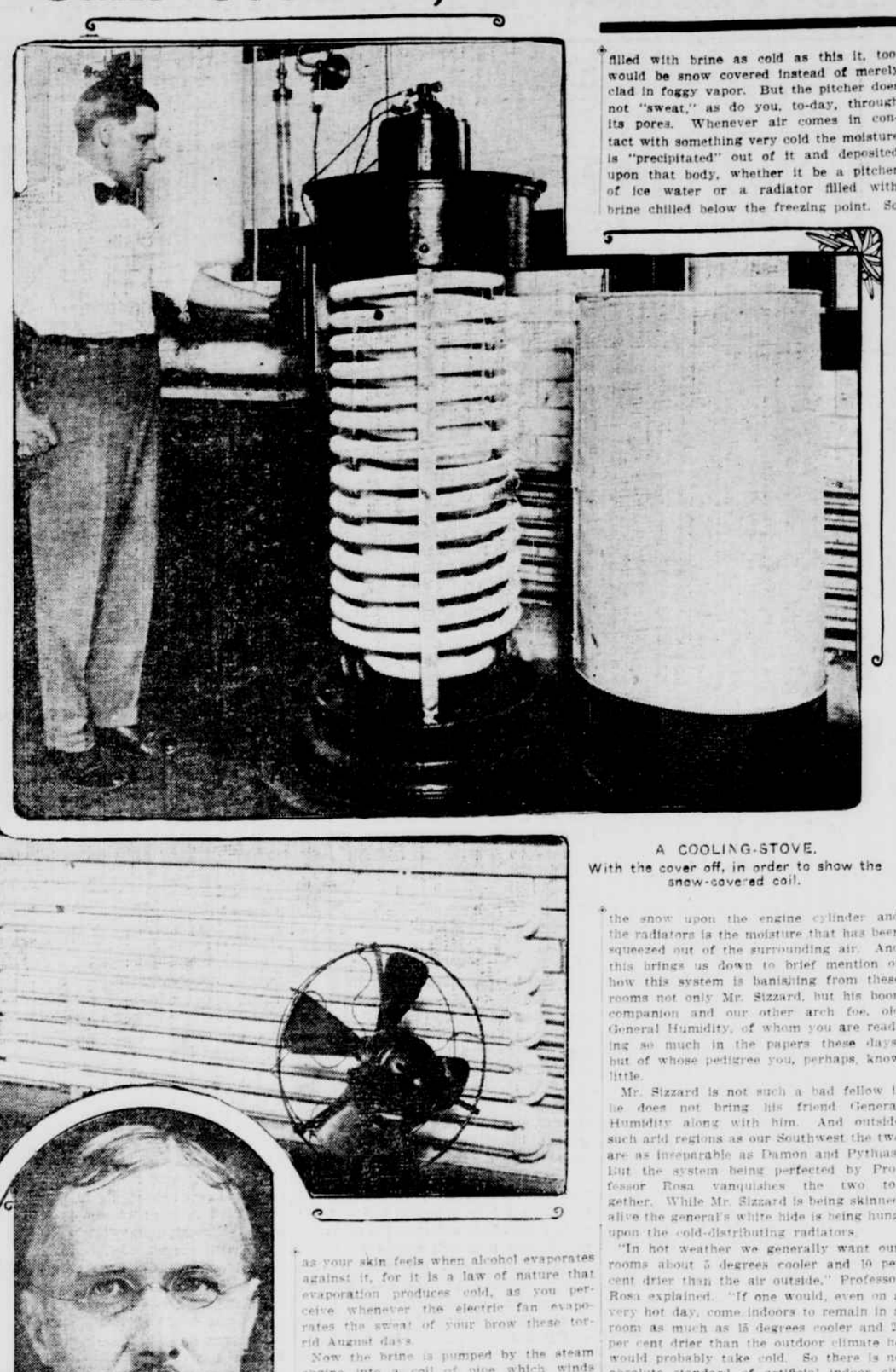
But to get your water cold enough to make a perceptible chill during this summer weather you must cool it down below its natural freezing point—a delightful prospect for that superman, the plumber, if you used plain, everyday water, for the pipes would freeze up and burst before you would have any cool weather on tap. Salt your water, then, and it won't freeze till far colder than would even be needed to give grandmother a touch of "rheumatiz" or pneumonia.

A SNOW-CLAD RADIATOR.
Fan blowing air upon it to be cooled and dried.

That is simple enough, to be sure. But you do not pile table salt or rock salt into your modern cool weather plant. Calcium chloride is the salt used here, and if you do not know what that is you will have to go to the encyclopædia.

Beneath the floor of the cold wave maker which I saw was a big tank, ample enough for Mother Hippo, out at the Zoo, to take her daily soak in. And in this great receptacle the brine is mixed to the proper proportions.

Over against the wall is a big cylinder of ammonia water, such as you use to clean your clothes, and this is being subjected to heat, which drives off the ammonia gas, which in another cylinder is condensed under pressure into pure liquid ammonia. And in a third cylinder this condensed ammonia is rapidly evaporating, which process produces a chill, such as your skin feels when alcohol evaporates against it, for it is a law of nature that evaporation produces cold, as you perceive whenever the electric fan evaporates the sweat of your brow these torrid August days.



A COOLING-STOVE.
With the cover off, in order to show the snow-covered coil.

Now the brine is pumped by the steam engine into a coil of pipe which winds around inside the ammonia cylinder, where the evaporation draws the heat out of the brine, through the metal of the pipe. And that is just how the brine is cooled. Another steam pump sends this chilled brine up through the building and, by way of a tunnel, into the neighboring building as well. It rushes through big pipes which have thick jackets of cork, the material which serves best in keeping the cold from leaking out. While I was watching the operation the brine was going up into the two buildings at a temperature, by your household thermometer, of 24 degrees below freezing, and after giving off its cold in the various rooms was coming back warmed up to 15 degrees below freezing, from which it was being cooled again and pumped back through the radiators distributed about the various rooms.

How did the snow get on the radiators? It is the same process by which the ice pitcher "sweats." If the pitcher were filled with brine as cold as this it, too, would be snow covered instead of merely clad in foggy vapor. But the pitcher does not "sweat," as do you, to-day, through its pores. Whenever air comes in contact with something very cold the moisture is "precipitated" out of it and deposited upon that body, whether it be a pitcher of ice water or a radiator filled with brine chilled below the freezing point. So the snow upon the engine cylinder and the radiators is the moisture that has been squeezed out of the surrounding air. And this brings us down to brief mention of how this system is banishing from these rooms not only Mr. Sizzard, but his boon companion and our other arch foe, old General Humidity, of whom you are reading so much in the papers these days, but of whose pedigree you, perhaps, know little.

Mr. Sizzard is not such a bad fellow if he does not bring his friend General Humidity along with him. And outside such arid regions as our Southwest the two are as inseparable as Damon and Pythias. But the system being perfected by Professor Rosa vanquishes the two together. While Mr. Sizzard is being skinned alive the general's white hide is being hung upon the cold-distributing radiators.

"In hot weather we generally want our rooms about 5 degrees cooler and 10 per cent drier than the air outside," Professor Rosa explained. "If one would, even on a very hot day, come indoors to remain in a room as much as 15 degrees cooler and 20 per cent drier than the outdoor climate he would probably take cold. So there is no absolute standard of artificial indoor climate to be maintained day after day. If the temperature outside is 85 degrees it should be reduced indoors to 80 degrees, or if it is 90 degrees outside it should be made 85 degrees within. But the chief object, to get comfort, is to reduce the humidity, which, if low enough to evaporate perspiration, means comfort. The ideal humidity in which to live these days is somewhere between 50 and 70 per cent. Above 75 means discomfort, and above 90 suffering. A chilled brine plant, such as this is self-regulating and cannot go to extremes of low temperature and humidity."

Within fifteen minutes after the chilled brine was turned into one radiator the humidity in the room had fallen 5 per cent and accumulated in a crust of dry snow an eighth of an inch deep. When it had reached a thickness of a half inch it commenced to look glazed and wet. The fall in humidity had now reached 10 per cent. Then the melting snow began to drip into a large stationary pan underneath, from which a pipe carried it out of the room. And thus was the oppressive humidity taken out of the room. Meanwhile, the electric fan blowing against the radiator was driving back into the room the air which was being thus dried by contact with the frosted coil of pipes. By the time the humidity had dropped 10 per cent the temperature had fallen about five degrees, and this balance was then maintained throughout the day. Solid comfort reigned within those four walls and no one wanted the windows open. Banish the thought!

This scheme of having the cold radiators immediately in the rooms is known as the "direct system," to which slightliness may be added by placing the radiators in closets grated above and below, a fan inside sucking the warm, moist air in at the top grating and blowing the dry, cool air out at the bottom. In the new electrical laboratory now to be added to the Bureau of Standards group of structures one of these closets is to be built in the wall between each pair of rooms to be cooled. The building is to be 190 feet long by 55 feet wide and five stories high, and sixteen closets will cool and dry thirty-two rooms. But this precaution is to be taken not on account of the comfort of the employes but for the protection of the delicate instruments, whose accuracy is disturbed by the condensation of humidity upon their insulations.

The other scheme for cooling buildings thus with chilled brine is known as the "indirect method." Where this is used great radiators are placed in chambers, in the basement or other convenient places, whence big blowers force the cooled and dried air through flues and out of registers distributed about the rooms.

### CONGRESS IN COLD STORAGE.

Our big law factory on Capitol Hill will, by one or the other of these systems, be fortified forevermore against summer extra session terrors, and Mr. Elliott Woods will profit by Professor Rosa's researches before he makes his final plans.

Now, you are asking yourself, as I did Professor Rosa, if the mind of man has devised all of these wondrous things, why, in the name of all that stews and sizzles, is the hide of man not profiting by them in hotels and theatres and the sacred precincts of the home? I am told that although the system has already been installed in commission houses, cold storage establishments, breweries and the cuisines of our great hotels for the protection of foods, furs and textiles, God's living creatures are not yet considered sufficiently worthy of such comfort, except in a few scattered instances.

One of these plants has just been installed in the State, War and Navy Building, in Washington, at a cost of $9,000. True, its function is to supply ice for the building rather than to cool it, but pipes, radiators and fans are the only accessories that would be needed to convert this little ice factory into a refrigerating plant big enough to cool a theatre of ordinary size.

"Suppose it cost $20 a day to operate it? Would it be a difficult matter to get the money back at the box office?" asked Professor Rosa.

"During the hottest weather," he added, "it would cost less than $1 a day a room of the average size of your big rooms in public buildings, or from 25 to 50 cents a day a bedroom in hotels. We estimate that to cool buildings it costs $1 a 'ton of refrigeration,' which adopted unit means the amount of cooling produced by the melting of a ton of ice."

Why will not the direct saving of human life give as great a return for this investment as the saving of furs, Oriental rugs and the reserve supply of egg, meat and poultry, stored away to protect, with other things, the high cost of living?

It was at this point that I was ushered into the room where the tests were being made with the fan and ice. Here are in progress careful measurements to determine the exact amount of ice needed for given amounts of cooling and drying of the air, and the apparatus measuring the fall of temperature and humidity record themselves upon moving paper bands.

## Private Houses, Hotels and Hospitals Will Also Be Cooled by This Process, Which Drives Old "General Humidity" as Well as Heat in Headlong, Helpless Flight.

For hospital wards the ideal device is what I termed the "cooling stove"—a sheet-iron cylinder about four and one-half feet high, grated about the top and bottom. Inside is about a 100-foot coil of one-inch iron pipe, up through which an electric fan sucks the air, which enters hot and humid at the bottom, but comes out cool and dry at the top. While standing near this cool wave churn I positively shivered. It received its brine from the central plant.

The problem of cooling hotel bedrooms is complex, according to Professor Rosa, because of the irregularity of their occupancy. It would be extravagant to keep the chilled brine circulating in all at once if only half of them, say, were occupied, and the question of keeping windows down would further complicate matters. But the cooling of local hotel dining rooms and parlors is perfectly feasible. Hotels which now operate five to ten ton machines for chilling foods and wines could probably cool their entire interiors by installing 50 to 100 ton plants.

A millionaire's mansion could readily be refrigerated by the $9,000 plant mentioned, but the cost of fuel and attendants would be greater than to heat the same house in winter—for, as we said, it takes more coal to produce cold than to create heat. Nor could the same radiators used for heating be employed for cooling, on account of the necessity of drip pans. An installation for the "indirect system" mentioned could actually be used for both heating and cooling, but separate radiators would, after all, be cheaper in the end.

Central plants may in the future pipe chilled brine, as they now do steam, to communities, but the cost of such a system would be prohibitory, save in exceptional cases. After all, the cost of refrigerating human habitations, both great and small, will depend upon the cost of fuel, for, as said at the outset, we can best fight with fire both hot weather and the devil, which, I wish to remark, are the same.



PROFESSOR E. B. ROSA,
Chief physicist, National Bureau of Standards.

### KNOTS FOR BUTTONS.

A Chinese diplomat, dressed in brocaded silk, was sitting out a dance beside a fountain with a Bar Harbor girl.

"Yes," he admitted, "my dress is pretty, and one queer thing about it is that it has no buttons—only knots and knotholes."

He showed her the fastenings of his flame colored jacket.

"You see?" he said. "Short cords, each with a knot at the end, and on the other side a knothole, or, as you would say, a buttonhole. That is simpler than buttons, simpler and easier. Do you wear pajamas? Yes? Then you must know that what I say is so."

"On my pajamas," said the girl, laughing a little, "I have buttons and buttonholes instead of knots and knotholes."

"How foolish of you!" said the diplomat. "But what I was going to say was that the knots we employ in place of buttons are of many kinds, and they have many names. There are plum blossom and cherry blossom knots for young girls' garments. Such you would wear. There are winter and snow knots for the aged. Soldiers have death knots."

"What kind of knots are yours?" the young girl asked.

"Mine? he replied. "Oh, mine are just the usual married man's knots."

"And what are they called?" she pursued.

"Knots of resignation," he answered, with a sigh.

Some folks wonder how the apple gets into the dumpling; but it's more wonderful still how the girl gets into the hobble skirt.

# Uncle Sam's Men of the Test Tube and Laboratory Prove To Be Daredevil Explorers

## There Are Scientists in Government Employ Who Perform Nerviest of Feats Out in the Open.



IT is just at this late summer season that those swashbucklers of science, the men who in her name penetrate to the remotest corners of the earth and wrest secrets from the unknown, are at their busiest. It is now that the explorers of the government departments are in the field, penetrating to the far interior of frozen Alaska, scaling the highest mountains of the continent, delving into the unknown corners of the deserts of the Southwest. In accomplishing these tasks they are meeting such emergencies as have turned back the amateur who has gone before them and failed. They have outstripped the adventurous spirits of the West who have left their bones to bleach on the trails that lead toward these accomplishments. The unathletic scientist has shown himself the prince of explorers. And he holds that there is a reason. The scientific theory of adventure is this: For the wise it does not exist. The only man who has an adventure is the man who does not know. A scientific man starting out to accomplish a given end sees every emergency that it is possible for him to encounter, prepares for it and meets it. It is impossible to surprise him, therefore an adventure never comes his way. There is no risk, no chance of disaster—theoretically.

There is Alaska, the inhospitable, for instance. The men of the government's Geological Survey went into Alaska ahead of the prospector. When the goldseekers came later there was the mark of the government surveyor as a location basis. When great deposits of gold or coal were found there was a report from a Geological Survey man which told all about it. When the Cunningham claims came into prominence the Geological Survey had all the information with reference to outcroppings around Carbon Mountain. It knows the streams that lead to the great interior and what is at their headwaters. It knows the passes that must be "mushed" in getting from stream to stream that will float supplies. Its men of science have discovered these secrets in their summer trips to this new land. Had men other than scientists passed through the experiences of these men there would have been romance and to spare in the work. But in this case a knowledge of the difficulties has discounted the adventure. But here are some of the experiences of the individual men.

A. H. Brooks, geologist in charge of the Alaskan work, knows more about that territory than any man living. He it was who took the first expeditions into Alaska, studied its geology, mapped its mountain ranges and reported upon its mineral resources. He it is upon whom Congress or any government department calls when it wants to know the facts with relation to things Alaskan. Mr. Brooks is a scientist, a geologist, wears spectacles, has long hair, does not believe in adventure.

DUEL WITH A MOUNTAIN GOAT ON A PRECIPITOUS LEDGE.

He was once guiding a boat up one of the streams while his partner pulled it from the bank. Under this arrangement, when the boat strikes the bottom the man in it always jumps out to lighten it that it may float free. On one such occasion, when the boat struck the bottom, Brooks jumped out, but instead of leaping into shallow water, as he had expected, he jumped into a deep channel alongside the boat. He was carried a long distance down the stream by the current, but finally scrambled ashore and overtook his partner, who was tugging away at the boat unmindful of the things that had happened to Brooks.

Geologist Elliott Blackwelder was another man in the Geological Survey who has penetrated to interior Alaska. A trip up the Alseek River is one of the accomplishments to the credit of his party. The stream is swift and shallow. Sometimes they poled and at others dragged the boat from the bank. High up the stream a series of rapids was encountered, with the snout of a glacier on one side and a precipitous mountain on the other. The stream was too swift for poling and too deep for wading. It became necessary to carry the supplies along the foot of the mountain and deposit them at the head of the rapids. On one trip, as the party crept along the foot of the precipice, the rumble of an avalanche was heard from above. The melting snows had softened the mountainside and the voices of the packers had jarred loose an overhanging rock, which started the landslide.

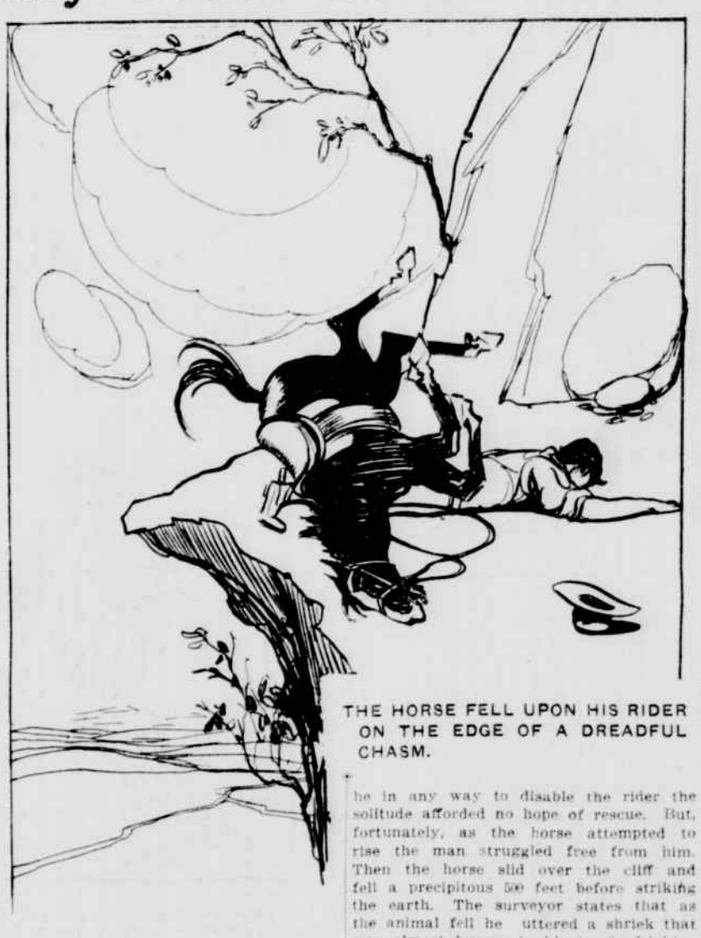
It bore directly down upon them. They cowered beneath an overhanging rock, and thousands of tons of earth passed over them. The boat was demolished, but no member of the party was injured.

Topographer R. H. Sargent and two assistants found themselves near the head waters of the Talkeetna River one summer as the season came to a close. There was danger of being caught in an Alaskan winter. The Talkeetna River was swift and strong, but its course was unknown, and there was the possibility of encountering rapids or a waterfall at any point. Yet the party built themselves a raft of such strength that no contact would break it up, tied their provisions securely to the raft, and got aboard. As had been expected, many difficulties were encountered. The experiences of a single day included the turning upside down of the raft when it ran aground in swift water, the knocking down of all three men when it struck a rock at breakneck speed and leaving one of them stranded on a rock, and the pulling off of two of the men by a "sweeper," or overhanging tree. In this latter emergency one man swam ashore and the other was lassooed around the neck by the man still on the raft and pulled aboard.

"STILES DISCOVERED THAT HE WAS BEING LOWERED INTO A NEST OF RATTLESNAKES."

The experiences of the wild are often strange and unprecedented, but Thomas G. Gerdine holds the record of having fought the only hand-to-hand duel with a mountain goat on the precipitous ledge that has ever been chronicled. Gerdine is one of the stout hearts of the Geological Survey, and the late 90's found him placing his mark on many a lofty mountain in many regions previously untrod by the foot of white man. It was while exploring Copper River in 1900 that he was separated from the rest of his party, and was following a narrow ledge above a stream in an attempt to find a passage around the mountain front. It was out on a narrow ledge that he met the goat. The animal had probably never seen a man before, and as a consequence was not afraid of him. Gerdine was indisposed to give up the ledge, and the goat showed equal determination. Gerdine was armed with a small hatchet, and the goat was armed with the effective frontispiece which is worn by all his kind. The goat charged Gerdine, who sidestepped and attempted to use the hatchet. This process was repeated several times without much damage being done on either side. Finally, in a passage-at-arms, Gerdine emitted a great shout, whether of fright or exultation it is not stated. The sound so frightened the goat that it jumped over the cliff and left the mountainside to the explorer.

Quite different from this experience was one which Robert H. Chapman passed through in the exploration of what is now the Glacier National Park in Montana. He was far up on the Swan range following a goat trail which was rough and dangerous. He had dismounted and was leading his horse when the animal stumbled, knocked him down and fell upon him in the narrow trail, which skirted the edge of the cliff. The surveyor realized the great danger which faced him as he lay under his fallen horse. Were that horse to flounder and fall over the cliff there was danger of the man being carried with him. Were he in any way to disable the rider the solitude afforded no hope of rescue. But, fortunately, as the horse attempted to rise the man struggled free from him. Then the horse slid over the cliff and fell a precipitous 500 feet before striking the earth. The surveyor states that as the animal fell he uttered a shriek that was almost human in his tragic fright.



THE HORSE FELL UPON HIS RIDER ON THE EDGE OF A DREADFUL CHASM.

Nowhere in the United States does the primal condition of lawlessness exist as it does in the Big Bend of the Rio Grande river, in Texas. Here is a stretch of land of such an extent and of such scattered population that an Eastern state might be dropped into it without the knowledge of any of its inhabitants. There is a cattle ranch once in a hundred miles, a quicksilver mine at Terlingua, an occasional visit of rangers in pursuit of a cattle thief and a well covered trail or two over which smugglers occasionally introduce tobacco and Chinamen from Mexico. Otherwise the country is left alone with its great solitude and the mournful howl of the benighted coyote.

It was into this region that Arthur Stiles, representing the Geological Survey, went for the purpose of making maps. His experiences were novel from the standpoint of the roll-top desk or the morris chair. For instance, in the spirit of the explorer seeking knowledge, he once allowed himself to be let down on a rope into a cave he had discovered. Such caves had been known to yield the mummified remains of prehistoric dwellers in this region, and Stiles was in search of mummies. Before reaching the bottom he, by chance, dislodged a rock, which fell into the cave. The result of its falling was the hissing of a veritable multitude of rattlesnakes which inhabited the chamber below. Stiles signalled to his assistants above to haul him up, and escaped the fate that would have been his but for the incidental falling of the stone.

So are the men of the test tube and the spectacles robbing the adventurers of the glory of their many accomplishments in the face of danger and death. So it is being demonstrated that adventure is a thing that comes only to the amateur, and is due to a lack of knowledge and precaution. So are the great feats in exploration and discovery now being made by the men of science rather than the lover of adventure. The season is now on when the autumn of this year, as in other years, promises additions to the store of knowledge, because these men of science have gone afield in the summer months.

WILLIAM ATHERTON DU PUY.

## These "Highbrows" Have a Novel Theory That They Avoid Risk by Discounting Peril in Advance.

### HIS OWN MEDICINE.

Governor Dix, at a luncheon in Albany, said of a political leader who had been worsted:

"He will get a little of his own medicine back now. It reminds me of a story.

"A man entered an eating house and ordered a steak and fried potatoes.

"'Yes, sir; steak and potatoes, sir,' said the waiter. 'And will you have chops and peas along with it?'

"'No, thank you.'

"'Roast beef then, perhaps, sir? The roast beef's very fine to-day.'

"'No, just steak and potatoes.'

"'How about a nice lobster or a brace of crabs, sir, with the steak?'

"'No!'

"'Shad roe and succotash, perhaps, sir?'

"'No, I tell you!'

"'A nice mess of fried catfish and waf'——

"But at this point the proprietor summoned the waiter to him.

"'What do you mean, you scoundrel,' he said, 'by tormenting that patron in such an outrageous manner?'

"'Oh, I wasn't tormenting him, sir,' said the waiter. 'I was just trying to make him feel at home. He's a barber.'"