SINKING A CAISSON FOR PORTLANDS NEW BRIDGE

"Sand Hogs" Working Under the Bed of the Willamette River for Pier Foundation.

Dangerous Vocation for Men Who Labor All Day in Subaqueous Compressed Air.

BY C. H. WILLIAMS.

BORING its way slowly down in the river bed below Swan Island, devouring the mud at the bottom, feeling along carefully, inch by inch, in its search for a solid foundation to rest upon, the first caisson for the Willamette River bridge of the Portland & Seattle Railway is being driven.

The caisson itself is a big, pier-shaped mass of heavy timbers and iron bolts, filled in with concrete. But at the bottom of this huge, 900-ton structure, men are working in a little compartment, into which air is constantly pumped to keep the water out and the men alive.

In the chamber below the river bed the men work like badgers, digging up the mud and slime with their hands. They are on their knees in the yellow water, and plastered with the muck which gives them an animal color, they look like strange, silurian monsters, half beast, half fish.

Their work consists of feeding the end of a hungry hose, called the pump, which eats sand and muck with relish. It sucks the solution up and carries it to the top of the caisson, where it is blown out like a stream from a fire hose.

The two-inch hose the men feed with mud is insatiable. The reason that it is always swallowing and is never satisfied is that the air in the little space below the bed of the Willamette is compressed until it exerts a pressure of ten pounds to the square inch above the usual atmospheric pressure that one is familiar with everywhere.

Life Always in Danger.

This same air pressure is the best friend of the men working down there with 900 tons of concrete, iron and timbers hanging over their heads like the sword of Damocles. For such a small thing might disarrange the plans of the engineers, and any one of a dozen little things would mean "curtains" for the pressureman, as he is politely called, or just plain "sandhog," if you would be his friend.

Meanwhile, he never thinks about these things, or, if he does, he never shows it. His work is to feed the end of that hose with mud and muck and mire. If somebody blunders, as he often does, it is up to the "sandhog" to drown helplessly. This happens, too, but if he dies he does it with his back to the wall, decently, as a man should. Or, if he whimpers and cowers, no one knows it, for in that little chamber fortified with timbers and concrete, he cannot make himself heard, no matter how hard he tries.

Breathing Compressed Air.

A little journey down into that hole under the river gives the uninitiated a sufficient number of thrills. First, one climbs into an iron tubing just big enough to admit a man. A little iron ladder is bolted to one side. You back down slowly, and in a minute it is pitch dark. Soon somebody whom you have never met—you learn later it is the first locktender—yells in one ear to flatten yourself against a side of the tube and stand on certain designated places, so he can open a trapdoor under your feet. You hear two sharp blows on the iron tubing, and a door closes further down. The man beside you opens his door and the air screeches through with a whistle that deafens you. Soon you go down this same ladder to another locktender and another door, and the process is repeated, the first door having been bolted down. This time your head feels queer and the ears ring.

"Hold your nostrils and swallow hard," is the command of the locktender. This equalizes the pressure on the ear drums and you can hear again. Soon you see a glimmer of electric incandescents below and you emerge, feet first, into the working chamber of the caisson. You now stand in the mud below the river's bed, 24 feet below the surface of the Willamette.

On the Bed of the River.

Here you see the sandhogs at work. They are original muck-rakers, on all fours, with their eyes on the end of the hose which they they are stuffing with sand and mud. On their knees in the mire, they are paddling the stuff to the end of that insatiable hose, which laps it up hungrily. The lights gleam mistily through the room, where the air is at such a pressure that one can't whistle.

A man's heart action increases perceptibly, and, although it is rather chilly, as compressed air chills things, you perspire freely and wonder why. One of the artists who came with me feels nauseated and his nose bleeds.

The clapper valve slobbers compressed air, clanging at every throb of the engine up above; you can hear workmen on the top of the caisson hammering on more timbers, but their blows sound a long way off. You know the man in the engine-room on the machinery barge moored alongside the caisson is watching his engine as a mother keeps guard over her baby, and that therefore there can be no failing of the air supply, but just the same one thinks how nice it is to see the open sky and visions are apt to come up of caisson accidents you have read about.

Aiming for a Hard Foundation.

The foreman pokes around quite as if he likes it, telling the men where to work out the mud next, and directing the settling of the cutting edge of the caisson. He carefully examines the mud, for it is like a sailor's chart to him, and tells just how deep he is. The caisson is aiming for a stratum of hard cement gravel which lies 40 feet below low water. The caisson is intended to imbed itself in this layer, which offers solid footing for the million-dollar steel bridge.

At the bottoms of the holes dug out by the sandhogs, the water is seeping in from the river, but at the cutting edge the air is bursting out every crevice it can find, for, although a caisson is calked with oakum as carefully as a sailing ship, this is not to keep the water out, but the air in. The pressure of the air inside must be greater than that of the water outside, or the caisson cannot work. If the air fails the water will come in and drown you, and this, too, makes you friends with that clanging valve that lets in the air from the compressor up above.

Although it is wet and slimy down there, things burn with a readiness never seen outside of compressed air. A timber will take fire with remarkable suddenness if it has an opportunity. The large amount of oxygen in the air readily aids fires. Sometimes the flame from a candle will catch on a timber and the fire may dart into a crack and ignite the okum calking. It may smolder there for days unknown to the workmen until it eats away the three-foot wall that is a barricade against the river. If this is discovered before an accident comes, the only thing to do is to "drown" the caisson.

When It Gets Extra Hazardous.

After one has been in that little chamber down in the ooze of the river bed for a short time, he is quite ready to come out. After being locked through the compartments, he is mighty glad to see the gray of daylight show at the top of the tube.

Pier 5, for which the caisson is sinking, will be anchored to the hard gravel layer, when it is reached, a few weeks in the future, by tons and tons of concrete that will fill the chamber where men are now working. Behind the working chamber concrete is being poured in as the caisson sinks, so that when finished it will be a solid pier of concrete, with three feet of timbers on the outside. The timbers will end at five feet below low water and the pier above water will be faced with ornamental granite blocks.

As the caisson sinks, increased air pressure is required, and the men work shorter shifts and the pay increases in proportion to the depth. Now they work eight-hour shifts. In the deeper workings, the men will come up with their noses streaming with blood. Some may be attacked with the "bends," but no matter how hazardous the work is, there are always men ready to accomplish it.

The deepest known caisson driving was done in Australia, where men worked at a depth of 108 feet. A pier in the East River, New York, also comes near the depth of the Australian work. A pressure of 45 pounds to the square inch is believed to be the limit of human endurance, and shifts of one hour only are worked in such conditions. The regular scale of wages for caisson workers does not recognize anything below 90 feet, this being the greatest depth that men are willing to risk the lives of others unless some extraordinary circumstances make it necessary to go deeper still.

There are many risks the caisson worker takes in his extra hazardous vocation. There is always danger of an accident to the air supply. The utter helplessness of the pressure men when anything happens makes the situation all the more fearful.

An accident occurred some time ago in the East when something happened to the air supply and the men made a wild scramble for the tube to get out of the death trap. In their mad rush they jammed the door to the air lock, and, imprisoned in the narrow tube, drowned like rats in a trap. When help came it was only by cutting the dead men to pieces that they could be taken out.

Oftentimes a caisson turns over while men are working in the chamber at the bottom. This is caused by too little weight on the caisson and too strong an air pressure below or by a tilting of the caisson because of the excavation of too much dirt on either side. A combination of such unfortunate mischances usually cause accidents of this kind. When this happens, the sandhogs drown as a matter of course.

Again, the strong air pressure in the working chamber may cause a "blowout," when the air forces itself through the mud below the cutting edge and escapes in a monster bubble at the surface of the river. This happens when the earth is dug away ahead of the lower beam of the caisson and the pressure of air breaks through the earth wall. After such an accident, the water usually rushes back and drowns the workers in the caisson.

Peculiar blowouts sometimes occur. Workmen have been blown bodily through the mud at the river bottom and shot up to the top of the water, inclosed in the big bubble of compressed air that would brook no restraint and have escaped unharmed. Such a case occurred in Boston. Another recent one was in New York. A workman in the shield which was being driven for a tunnel under the East River was suddenly shot out of the tunnel by a blowout, and he gasped with surprise when he found himself at the top of the water unhurt. While he was wondering what had happened, a passing boatman pulled him into a skiff with a boathook.

It is not often that caisson accidents end so happily, and the responsibility for the lives of their men is a heavy one to engineers directing caisson work.

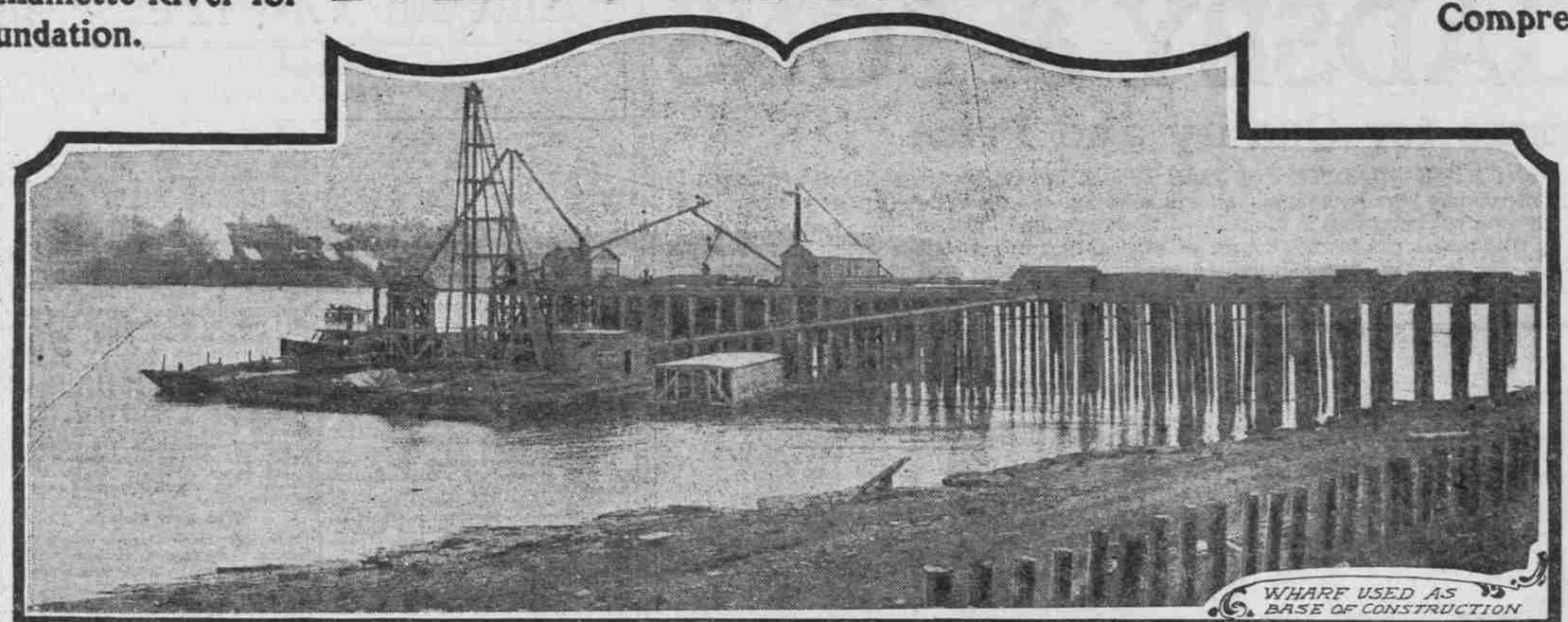
Produces Mysterious Disease.

But more perilous far than the occasional accident is the mysterious, dread disease, the "bends," which is still a puzzle to physicians and for which no remedy has been found. It acts as a temporary paralysis of parts of the body, and is very painful. After several attacks, caisson paralysis, a permanent disability often results.

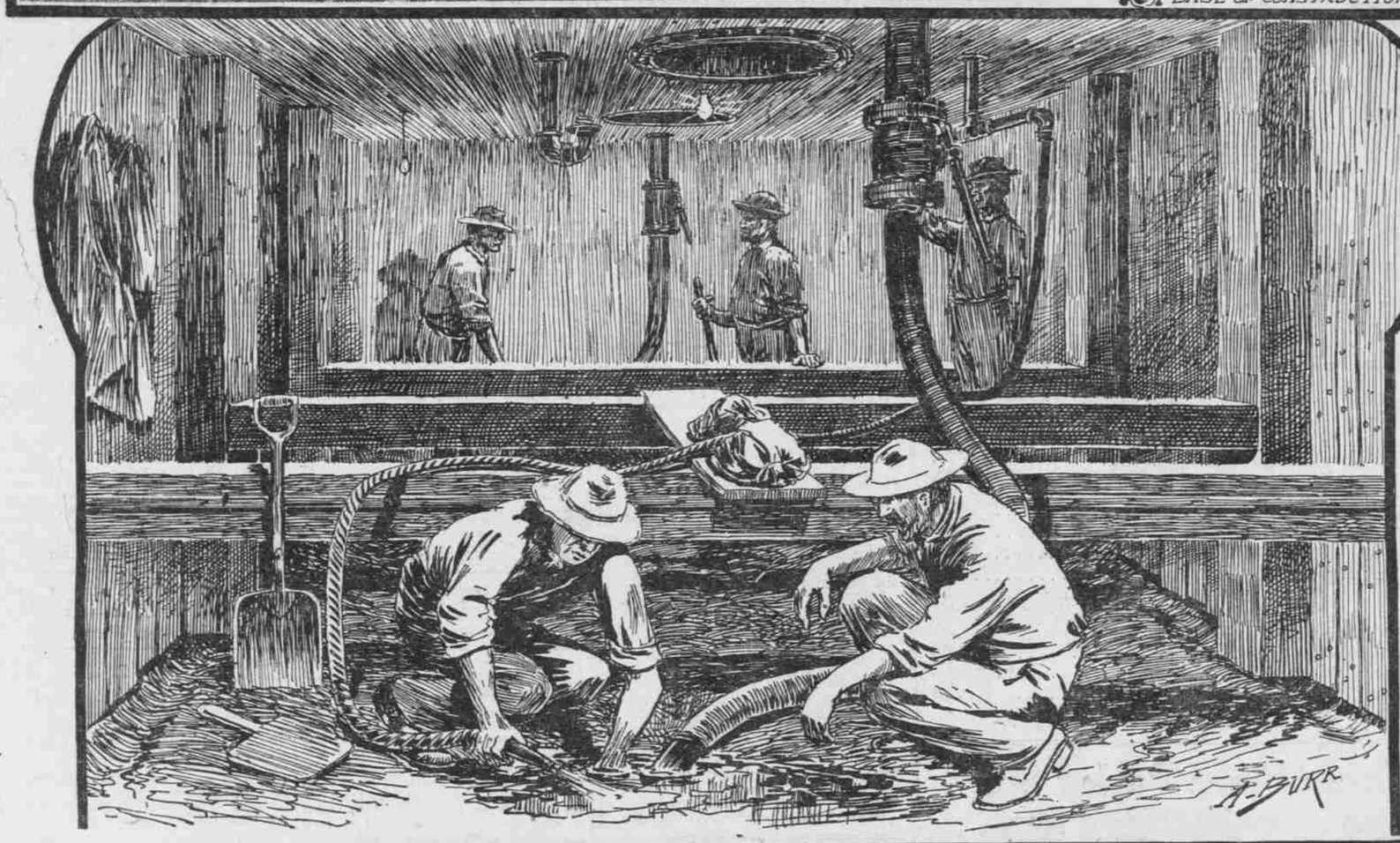
A peculiar feature of the bends is that while in compressed air workmen do not suffer from it, but as soon as they reach the surface they are taken with the most violent cramps and pains. The disease is supposed to be brought on by the pressure of air cutting off the circulation. When the pressure is released, great pain follows.

A pneumatic caisson is no place for workmen who are not in good health, or who are not level-headed. Oftentimes the lives of the whole crew are imperiled by the actions of some foolhardy pressureman. In building a bridge across the St. Lawrence at Quebec a whole crew narrowly escaped drowning because a number of French Canadians on the work determined to whip one of their fellow workmen.

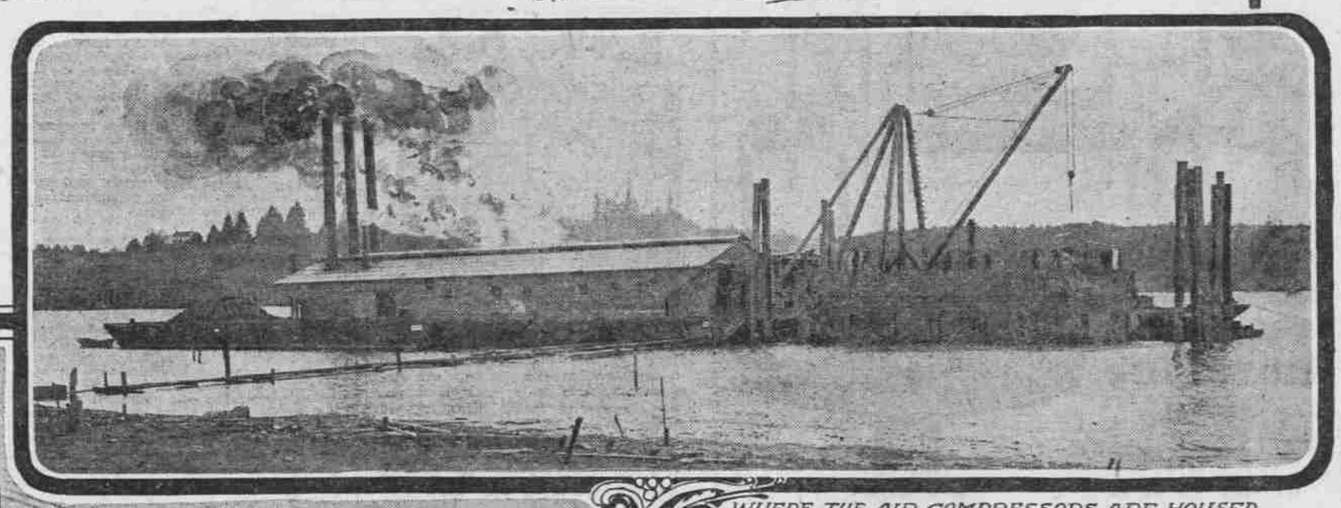
The Canadians were not experienced in caisson work, but they held a grudge against an older man in the party and suddenly pounced upon him and beat him. In the scuffle that followed the end of the pump was thrown out of the water and the air rushed screeching out of the pipe that usually carries water and mud. This lowered the pressure and water poured in from the river. The fighters were deep in water before they noticed their plight, and, becoming alarmed, released their victim, who knew the remedy and saved the lives of the crew.



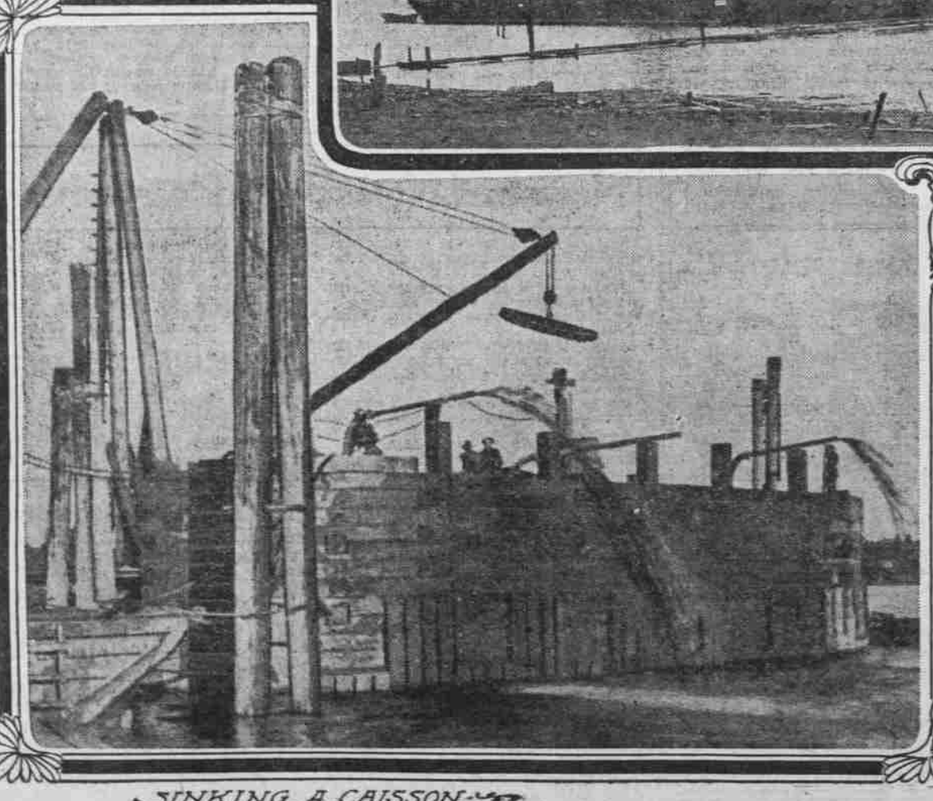
WHARF USED AS BASE OF CONSTRUCTION



WITHIN THE CAISSON—EXCAVATING SAND FROM THE RIVER BED



WHERE THE AIR COMPRESSORS ARE HOUSED



SINKING A CAISSON

Musings for Three Minutes

BY MARCUS W. ROBBINS.

IF you wish to be a success in this world, hire a barker with a megaphone. It will increase the gate receipts.

Get the crowd to coming your way and it will be but a short time before you can be lolling around in a Morris chair, drinking mineral water and taking a sea voyage to the Sandwich Islands. Don't get them, and it means that you have to get up early to catch the first trolley down town, have a glass of beer and free lunch for your dinner, and get baldheaded footing columns under a gas light.

But getting the crowd, that is the question. The hardships of the early pioneers is not in it with this modern problem. The old settler can give you all the harrowing details of how the Indians once chased him half way across the state, or how at one time he got snowed in on a prospecting trip and nearly starved to death before he could get out. These stories are ofttimes hairraising and make you hold your breath and wonder that the poor man ever lived to tell the tale. But getting and keeping the crowd beats them all. There is often just as much excitement in running a corner grocery and trying to keep from going bankrupt as there was in being chased by the Indians. Then again a fellow can get a reasonable amount of trouble out of trying to corner the wheat market or going long on Amalgamated. He can get enough to cause him to sit up nights and do some figuring.

Once get the crowd and you are all right. You can be nominated Governor of New York, President of the United States or Constable of the precinct. To get the crowd you have got to attract their attention, and noise is the great American method. The scale keeps on rising higher and higher each year, and if it goes on much longer we might just as well live in a boiler factory. The billboards are getting bigger and bigger and the scareheads in the newspapers larger and larger. If these latter keep on growing, they will have to be run as a separate edition.

The megaphone is typical of our present age. In fact, it might properly be classed as the megaphonic age. Everybody shouts from the housetops, and these are not any two-story adobe affairs, but are 14 to 20-story steel skyscrapers. It is a long ways down to the ground, and that has a tendency to make the shouting a little bit strenuous and the mixture of the sounds is somewhat confusing.

The travelers along the sidewalk get a jumble of sounds about Alkali Ike's Soap being best for the complexion; that the Guaranteed Rebate Railroad is the shortest route to Chicago, both going to and coming from (I can appreciate the desirability in the latter case); that William Ward or some other fellow will save the country, provided you elect him to Congress.

Thus the changes are rung, from face powders and automobiles to Cuban Generals and reform District Attorneys.

Instead of going West, get a megaphone and commence to holler.

Grant's Pass, Or.