

TELEPHONING WITH SUNBEAM
Prof. Bell's Novel Invention Promises Another Revolution.
IMPROVEMENTS IN TRANSMITTING SOUND
The Radiophone a Marvellous Instrument of Great Commercial Importance—Full of Shadow Made Audible.

Prof. Graham Bell is devoting his attention this summer to the commercial development of a wonderful invention of his which involves nothing less than telephoning by means of a ray of light. A few weeks ago I had an extended interview with the inventor regarding this marvelous instrument, the substance of which is here given.

TALKING OVER A SUNBEAM.

It was out of these researches that the wonderful instrument upon which Prof.

surprised and mystified. But the accident told Prof. Bell that he had made a further step in his researches, that he had opened a new gate to further knowledge of the subject. He had discovered that the process of telephoning was not conducted by the visible rays of the sunbeam at all, but by the invisible rays, of which we know only by inference.

If you split up a sunbeam by means of a prism on each side of the spectrum there will be found to be certain rays which are not visible but which still have the property, some of them of developing heat and others of affecting a galvanometer.

The peculiar quality of these invisible rays is that they will pass through substances which the visible rays of light will not pass through. This is just what happened when Prof. Bell thrust this piece of India rubber into the sunbeam's path in his experiment. The phenomenon showed that it was these invisible rays, which really took up the sound vibrations and carried them along. And so from this Prof. Bell was led to change the name of his device from a photophone to a radiophone. By this new phrase the inventor was able to give a clearer and more accurate descriptive name to his invention.

It happened one day when Prof. Bell wished to make some experiments that the selenium was all gone and just by way of trying a number of other substances he tried to see if they would act in anything like the same way. It was just from this chance experiment that it was found that there are a great many substances that will do almost as well. One of these was ordinary black wood. And just to show you how large a part mere chance plays even in

COOLING OF A RED HOT TOWN

Cripple Creek as it Appears Rising from Its Ashes.

THE EARLY FLAVOR GONE FOREVER

Glimpses of Active and Industrious Life in the Famous Camp—The Men Who Work and the Floating Population.

CRIPPLE CREEK, Sept. 3.—The new Cripple Creek is a swarming, shapely, increasing mass of brick and mortar. Last April the old town was swept away and the principal street is just now being rebuilt in brick. The residence portion of the new town has moved toward the west, and like the old town, is made up of the same higgledy mixture of small wooden shanties, slab huts, tents, cabins of papple-trees and firs and wagon covers.

The new buildings of the business streets are of brick and very solid and substantial, but the great mass consists of shacks, in temporary, tent-like structures scattered over the gray-green slopes of the hills without form or grace. Seen from its divide the town seems like a heap of toy blocks flung on the smooth grass.

The whole camp seems to me to have lost flavor some way. It is rapidly becoming commonplace. It is filled just now with ordinary workmen from the states, masons and hod carriers, and carpenters, and the gambler and the cowboy are hardly in evidence.

On the hills cowbells tinkle, mules bray, dogs bark. The sound of hammers is incessant down on the main street, and men swarm among the stacks of brick and lumber thick as flies around sugar lumps. Notwithstanding the crazy prices for real estate and the charges for rooms and houses, it appears to me that most of the people in Cripple Creek are only tourists or adventurers who are in town a few days. They hardly seem to me to be decided about living there. Many of those who are settled appear to lack the money to get away, but I can't make myself believe the town is a permanent one.

TEMPERMENTS FOR THE IDLE

Each day brings swarms of wild-voiced and innocent-eyed young farmers and workmen from the east, to the first of whom they stay a few days trying for work, then turn face to the east again and others take their places. The gambling dens and saloons here, characterized by the first class of the west, are not finished, and they have been running full time for some weeks. The betting is not very exciting, being mainly in small sums. Here, also, the young men from the states who want to get into the money in Cripple Creek has had a strong influence. It is possible to gamble in nickels now. Everything is being scaled down in price except rent of houses, which will drop soon. "The town is over advertised," many of the workmen say. "The talk about rebuilding has brought men swarming in here. Everything is overdone. The men to keep away. There's no work here."

One of the first places I revisited was the placer up above town to the north. If I were ever tempted to dig for gold it would be in placer mining. For there you are able to "clean up" and find out just where you stand at any moment, and suspense is short-lived. The town is a little better in the panning out of pay dirt. As the wily water slips away from the black sand and shining grains and small lumps of gold begin to appear it quickens the blood even in one not given to gambling.

Last year I wandered about on the Mesa talking with the miners and watching each man as he cleaned up his pan. He would say he owned the mine, and he would watch him till he peered on his small pan of mercury, "quick," they call it, to gather up all-but-invisible metal fine as baffled flour. I found just as many working there this year—but not one of all the many who were working there in 1895. They come and go restlessly.

DOES NOT PAY.

They were a little less hopeful than last year. "The pay-strikes are all worked out—sometimes a fortnight ago, and they don't get it. Offerer he don't. It's good luck to make \$1 a day, and we pay 25 cents out of every dollar as royalty to the cuss that says he owns the mine. It's a better bet than doing nothing 'n' bummin' your way." This was practically the word of all. It paid barely enough to buy meat and flour, and get "it best" around the street for a free lunch counter. The town's best well advertised by the fire and all, and it swarms with men out of place. "This is no camp," said another. "It's just this—a way: You're bleeged to have money to defend your claim in the place. You can't make a business of it. You can't get any air plum sure to pile onto you seven deep purdlin' yer claim is worth anything. The town is a better place than any other it goes. A poor man ain't in it knee high to a yaller dog."

Most of these men are Missourians and all of them have had vast experience. One had washed gold in California in the 50's and in Montana later. Here in the Black Hills in the 70's. "I tried farming a while in eastern Colorado and now I'm a-thinkin' of tryin' the Hahee's peak country." He said in conclusion: "Always hoping to strike it somewhere."

Another had been everywhere the last speaker had been and also in South America. One man had a gold mine in Colorado and a soft, mild, slow voice, which made me forget what he was saying, so full of grace and gravity was his tone.

In a low "drift" a couple of boys were working, drawing the pay-dirt out of the hole in a big, broad pan with a wire for a handle. One of them was from Pennsylvania and the other was a native of Colorado. Both were plump, hearty and profane, and they ate tobacco like veterans of the war of 1812.

One called the other "Uncle" and as they gravely put heads together over their pan their intenses was comic. They had only been at work four days, but had made three dollars apiece. They were talking of emigrating to some place where they could get on their feet. They will finally drift away like all the rest and others will take their place.

PLACERS PLAYED OUT.

The city is building out over the placer and the washing for gold will soon be done. The land will be sold in lots and the placer around the toilers were set their wagon covers and tents and little shanties, and at times their wives and children came out to meet eagerly into the camp. Outside the joy of a good showing or to comfort the toiler if luck were bad.

The men dig silently, for the most part, with little communication of any sort. They pick down through the rich loam of the sward till the bed-rock is laid bare, then they "drift" out along the line of any pay streak they may strike. Once in a while they strike a small nugget—but not often. They hack away at their little machines without enthusiasm, and with just enough of hope to keep them working. In point of fact Cripple Creek is set in the midst of a rich mining camp where the mines are concentrated into few hands. It offers less and less chance every day for the man with small means. It is not likely that the world in this. "The big fellers at the little fellers." Also there are many mines "developed" to the point of production—but not being worked. Mines used to guil the eastern capitalists by shrewd managers. The schemes whereby the eastern tenderfoot is reaped into buying a hole in the ground are exorbitant and marvellous pieces of verbal mechanism. The figure got a little mixed, but the truth remains.

UNLOADING MINE STOCK.

"Why," said one promoter, "I tell you, you can sell 'em any time you want. I sold \$25,000 worth in three days—man stopped me on the street to buy."

schemes there is little chance for the poor miner. The wealth of the earth should go to the common man in a large degree than it does. Probably he is not a strong man, but he can't beat that; he does the best he can and should be paid for it. I should like to see him "strike it rich" somewhere—some lonely spot where no smart lawyer or great syndicate could come between him and his mining sand.

There is only one place where that could conceivably happen, and that is in heaven. But if there is a discount upon Cripple Creek—if it is losing interest and destruction of wickedness and growing humdrum—there is no discount on Cripple Creek's scenery. The day was like April—the wind cool, fresh, the prairie grass set with wild flowers, the sky radiant, pure as a maiden's eyes—and the mighty ranges to the west and south majestic as ever and more alluring than ever, for they are beginning to have the further charm of familiarity.

P. S.—Some local poet in Victor "rubs it into" the common man in the following fashion. Victor, it may be explained, is a rival town some five or six miles over the hills:

WANTED TO KNOW.
A stranger from the distant east
Begrimed with travel stain
Came off at Cripple town
From an early morning train.
A near hotel he quickly sought,
His hunger to satisfy.
And after breakfast caught the clerk
And talked to him this way:
"The wonders of the world I've read about
The Independence mine,
The wonders of its treasure vaults—
The walls with gold that shine,
I'm curious now to view it,
Now, will you take a stroll;
To reach that mineral hole?"
Repressed a rising groan,
And answered, with a faltering voice,
"I'll take the next suburban."
"That goes to Victor—see?
And you for the Independence
In that locality."
The stranger, disappointed,
But broke the stillness painful
With stanzas of this style:
"Well, what about the Portland?
That's heretofore, I suppose?
One of your famous 'diddle mines,
As everybody knows,
I'll take a walk and look at that,
But the clerk just faintly murmured,
"That mine's at Victor, too."
The stranger paused a moment,
"Then gave it to him raw—
"And the hills of your Battle mountain,
The clerk turned pale and gasped for breath,
"Eyes over on the floor,
And the subsequent proceedings
Interested him no more.

The stranger grabbed his grip sack
And hastened to the train—
The chance he'll not be caught
In Cripple Creek again.

SIX-TO-FIVE.
There is just as much truth in this skit and Cripple Creek wince at it a little.
HAMLIN GARLAND.

TIME SPENT IN SHAVING.

Over 200 Days of a Man's Life Passed
People as a rule admire a man who possesses a face that shows the bright look of cleanliness and youthfulness that is the result of a good shave. No matter how good a quality a man's clothing may be or how late the style in which they are made, he does not possess that look of refinement that naturally belongs to a man whose face is marred with a stubble. There is nothing that will bring about this refined effect so well as a shave, says the barber. It is not only a matter of appearance, but it is a matter of health. Many people who admire this bringing out of the features in such a clear cut and pleasant manner really know how much time and trouble is required in acquiring the youthfulness of countenance that they so much admire.

Few people have anything near the correct idea of the time lost by the ordinary man in barber shops. The business man who looks so natty in correct and well-fitting clothes, with his smooth, clean face, gets shaved on an average of about four times a week. When he goes to the barber the first time he may be lucky enough to strike a time when there is no customer about, and as a result he is shaved and back to business in about fifteen minutes. The next time he goes he is not so fortunate, and about thirty-five minutes are consumed. The third time he may take even longer, and the fourth time, in the afternoon, which is usually on Saturday, he may find quite a number ahead of him, and very often he is compelled to wait fully an hour before he is shaved. In this way the business man spends on an average of two and a half hours each week in a barber shop.

It does not seem long for a week, but when you calculate the time spent in this way in a lifetime it is enormous. At the above rate, which is very low, the business man, computing that he starts shaving when he is 20 years of age and lives to be 60, continuing shaving during the interim will have spent nearly 217 days in a barber shop. If he gets shaved but three times a week, and makes the most of his shaving, he will spend the same length of time as in the above mentioned instance have spent nearly 150 days in a barber shop.

The time lost in the time lost and does not include the expense attached to the operation. In the barber shops patronized by business men of any standing what they take in a shave is never less than 15 cents. Usually, too, there is a tip of at least a dime for the barber and a nickel for the boy who brushes your hat and combs your hair. In this way the business man spends on an average of about \$1 per week. Even at this rate it costs the ordinary laboring man a few hundred dollars during his lifetime for his indulgence in the luxury of a clean-shaven face.

Lessened the Tenderfoot.

Washington Star: "What we pride ourselves mostly on in our sassiness," said the tenderfoot of the leading hotel in Waycross, Ariz., to a guest from the east, who told the story to a Star reporter.

"You couldn't find more refined sassiness anywhere in the country than right here. My darter plays the piano, sings and talks four languages, not counting Injun. She's full of fun, but she kin give any woman anywhere a run for her money. She kin beat 'em all, it's her that's raised the tone of sassiness to what you find it here."

At that moment there was a sound from the land and the tenderfoot turned. He rushed to the window, and a crowd of excited men, women and boys were following a man who was bound and being driven along the main street by a team of mules.

"What does it mean?" I asked.

"Nothin' much, but if you want to see fun come along. My darter told me they was coming to the country this mornin'. You see, there's a big tenderfoot fur three days a regular dude; want'n nothin in the feller. I s'pose, but things was gittin' dull, so Maggie made up her mind to give 'em a show. She looked like they was goin' to hang him, and I see she's cotched him. That's a heap of fun in that gal."

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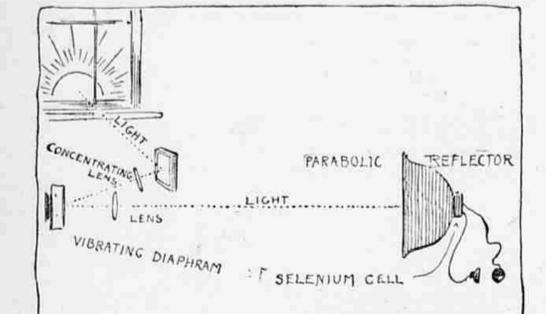
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MECHANISM OF THE RADIOPHONE.

Bell is now again at work sprang. He gave it originally the name of the photophone. Put in the broadest way, it is aimed to substitute for the ordinary telegraph or telephone wire a ray of light. Doubtless there is many a man who would question the sanity of any one who would claim to be able to talk for an indefinite distance over a sunbeam. And yet this is exactly what Prof. Bell has succeeded in doing. The mechanism which he devised does not differ widely from the telephonic mechanism, and in fact in the fact indicated that it substitutes a ray of light for the usual copper wire. The illustration which accompanies this article gives a very fair idea of its mechanical features.

matters of pure science, Prof. Bell goes on to tell of how one day he was out of black wood, as well as selenium. There was white wood, however, and he substituted the latter in the lamp. And this worked better than ever. It was only a little further step to expect with lamp black itself, and finally with just plain soot. And the last it was found was the best of all.

There is first of all a transmitter, which is made up of a thin diaphragm of mica or of some other substance, silvered at its back so as to make of it a reflecting mirror. The diaphragm is connected with an ordinary speaking tube, into which the operator talks just as exactly as he would talk into the transmitter of a telephone.

So, one chance experiment after another, it came to be that Prof. Bell devised a talking machine, literally, out of a sunbeam and a small phial of soot. At first all the experiments were conducted in the laboratory between two rooms and another, and it was not until the summer of 1895 that Prof. Bell's co-worker, Sumner Tainter, climbed up with a radiophone transmitter into the cupola of a school house a considerable distance away. Prof. Bell was at the receiver by one of the laboratory windows, wondering, just like Idris Green, "whether the fool thing would work." Into the transmitter Mr. Tainter cried: "If you hear what I say come to the window and wave your hat!"

Against this thin disc or diaphragm is projected a ray of light, preferably sunlight. The light is caused by a mirror and directed through a concentrating lens whose focus is the transmitting diaphragm. The latter in turn reflects the ray through a second lens, which again makes the components of the ray of light parallel, so that it may travel any distance without dispersion.

At the other end of the line is a receiving operator located, there is a parabolic reflector, at the end of which is fixed a selenium cell. The latter in turn is connected telephonically with the receiver. When the ray of light is reflected from the transmitting diaphragm and the operator speaks into the tube joined with the latter, which again makes the components of the ray of light parallel, so that it may travel any distance without dispersion.

The theory upon which this instrument is built is that a ray of light may be impressed with the sound vibrations in exactly the same way that an electrically charged wire is impressed with the sound vibrations from the telephone when you talk into the latter, what takes place is simply this: The electrical circuit being brought into connection with the carbon diaphragm, against which your voice strikes, the wire or current is set in vibration, or rather the sound vibrations or waves are impressed upon the electrical circuit, and waves, just as if you were to start a series of ripples in a pond and then add to these a second series of a different character, which would follow in the same way, but not the same line of vibration or wave motion. This of course is putting the matter crudely, but it represents the notion of the scientific idea which has got into my own mind, and which I hope is sufficiently clear to the reader.

But it is possible that with the advance of electric lighting, and means of generating the X rays, a simple and practicable way will be found to produce a light that will rival the sunbeam, at least for this purpose. The conditions are that it shall be sufficiently powerful, and at the same time steady. If it does not possess the latter quality, in trying to talk over a ray of light you would experience the same sort of confusion as when you tried to telephone over a ray of light which had not been steady from some other source.

It follows from the process here described that if speaking against the carbon transmitter will set up such an agitation in an electrically charged wire a mechanism which will just reverse the action of the carbon diaphragm will reproduce a similar set of vibrations upon a diaphragm at the other end of the line and thus reproduce your speech. The reader is reminded that all the trend of modern physical science is toward establishing the close relationship of the different forms of molecular motion, which for the purpose of distinction are variously called light, heat, electricity and sound. So close indeed is this relationship that the late Prof. Tyndall, the very highest authority on the subject, has shown that some of these phrases, notably that of "light," as simply confusing. And the further science has gone the more it has come to see that the difference between these varying modes of motion, the only difference between light and heat and electricity and sound, is a matter of degree and rapidity. It has found that it is not very difficult to convert the one into the other. The conversion of heat or electricity into light is so familiar and commonplace a process that we do not wonder at it at all.

Now, however, with the rapid progress which investigators have made in this direction, Prof. Bell has again taken up the work, with a view to making the radiophone a practical and commercial invention. It would never do of course to have an instrument that is dependent entirely upon sunlight for its workability, and in fact, the time it looked as though the radiophone would be of no use to anyone save men of science.

It is likewise easy to see its utility in times of war, when it would be impossible to string a wire, or when a wire might be cut by the enemy. By this means free communication could be established between armies considerably distant from each other or from a lookout to the headquarters.

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Parental Advice. Cincinnati Enquirer: "My son," said the graybeard, "you are about to go forth to do battle with the world."
"Yes, father," answered the young man.
"One of the first things you should learn, my boy," the old man continued, "is to learn to say 'no.'"
"I think I understand."
"I dunno whether you do or not. The point I am trying to get at is that the habit of saying 'no' and 'no' is a habit that you were in college, but it ain't the correct thing for a business man."

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But to say that this is "telephoning by means of a sunbeam" is really a very crude and inaccurate description of what actually takes place. This was what Prof. Bell discovered by accident one day in the course of his experiments. It chanced that he thrust in the path of the ray a disc of India rubber and he found that communication was not interrupted in the least. If you could have been there we should have been both

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