

How Machinery is Repaired and Great Tools Built at Panama

EVER HEAR OF PICKLED FEET?
SOUNDS FUNNY, DOESN'T IT? BUT IT'S SERIOUS—DANGEROUS—DISTROUS! YOURS MAY BE PICKLED—HOW DO YOU KNOW?

(Copyright, 1912, by Frank G. Carpenter.)
ORGONA, Canal Zone, Panama.
—I want to show you the greatest industrial exposition the world has to offer. It is now in operation on the canal zone. It is not a dead mass of silent machinery, but a great, noisy, whirling combination, drilling, digging and blasting a gorge through the longest mountain chain upon earth. It includes mighty dredges which are conquering the ocean, and a myriad of trains which are moving material faster than the wildest creations of the dreams of Aladdin.

Much of the exposition has already been pictured, but the parts I shall show you today are outside the great ditch. They are not engaged in the work itself, but in keeping the mighty forces in good order. I refer to the repair shops of the isthmus. There are ten of them, scattered along the canal with galvanized iron and inhabited by thousands of mechanics, who are creating new machinery and repairing and strengthening that now in use. There are vast warehouses filled with all kinds of supplies from bits of steel as fine as a needle to the mighty arms which lift the steam shovels, from the finest silk thread to cables as thick as your leg and from the hard bits of wood used in the patterns to the log-like planks for repairing the Lidgerwood cars.

Right here at Gorgona are more than twenty-one acres of machinery engaged in making repairs, and at Empire, only about six miles away, are other great shops where steam shovels are erected, locomotives mended and broken heavy machinery of all kinds made new. There are smaller repair shops at Pedro Miguel and Gatun, devoted to the construction equipment of the locks near by, and, at Cristobal and Balboa, still others devoted to keeping the big dredges in order. The variety of work is beyond conception, but you can learn something of it by the story of what I saw today.

Machine Shops at Gorgona.

Take, for instance, Gorgona. This is the biggest repairing establishment Uncle Sam has on the isthmus. It was begun by the French, and when I was here in 1905, it had just been cut out of the jungle. When we bought the canal the engineers did not know of its existence. It was hidden in a dense vegetation and they were surprised when they found a building covering a half dozen acres, containing a complete equipment of machine tools, including stationary engines, and over 100 carloads of foundry and machine shop supplies. The works were at once rented and put to repairing the French machinery for use on the canal. At the time I first saw them, they had already repaired 1,000 dump cars, thirty or forty locomotives and a large number of cranes, excavators and drills. Among these was an old French excavator, which was put into service in the Culebra cut, and used nearly eighteen months, until replaced by a steam shovel.

Shortly after that time the government decided to make this its chief shop, and since then it has been doing most of the repairs with the exception of that on the steam shovels and some of that on the dredges. During this trip I saw men at work on the heaviest of the canal equipment, handling the masses of iron and steel which weigh many tons and can only be lifted by steam cranes. I saw them also working on clocks, watches, adding machines, typewriters, and water gauges, and doing the finest of jewelry repairing under the same roof. In addition to fixing the old tools of the canal they were making new ones, and were also adding to the strength of the machinery just sent down from the states.

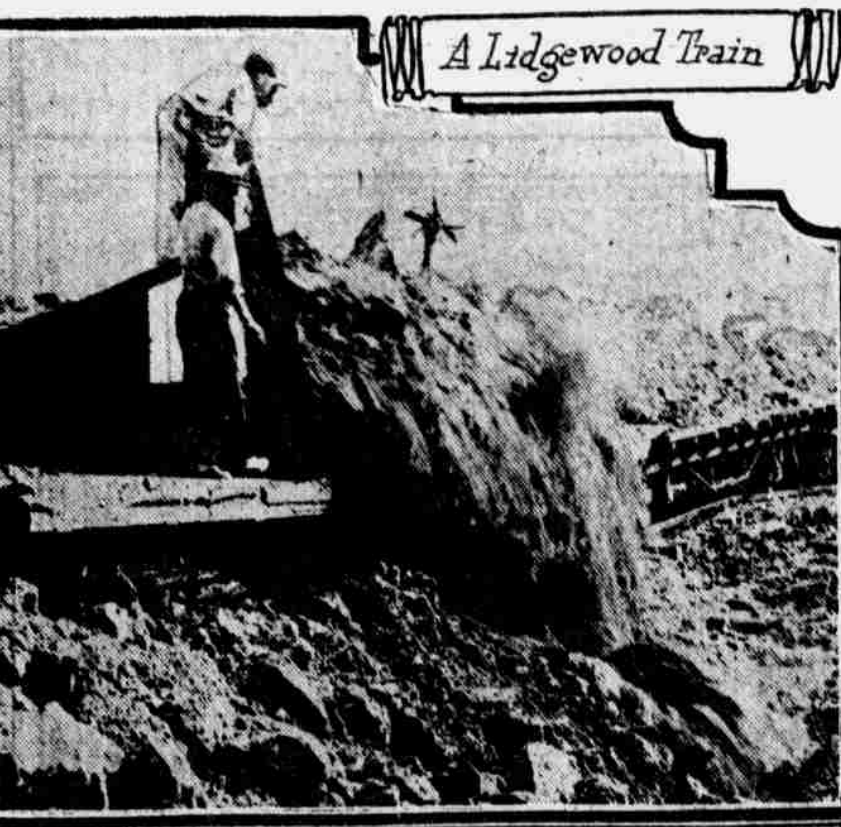
Inventing New Machinery.

I went through the works with the superintendent, Mr. A. L. Robinson, who has under him something like 3,000 mechanics. He talked with me as to the strengthening of the machines. Said he: "Nearly every part of these big tools sent to the isthmus has had to be remade or strengthened, as the most of them are not strong enough to do the heavy work here. Take, for instance, the spreaders, which smooth out the dumps, each doing the work of hundreds of men. We ordered the strongest, but those which came were not sufficiently strong for the work. We then brought down the inventors, and they stayed for two months on the isthmus studying the problem and trying to make new machines. One of these men designed a spreader, which looked all right upon paper, and we ordered eight. When they came, we found that they were still too weak, and we had to bring them into the shops and strengthen most of the parts."

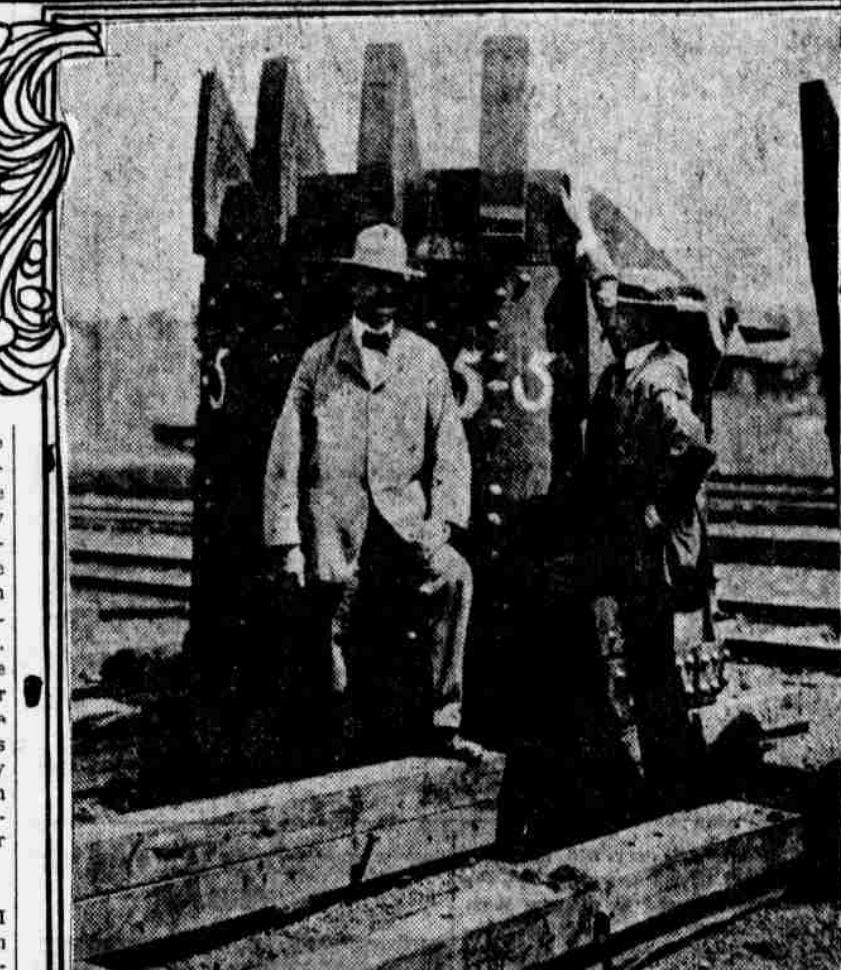
"As a result of this kind of work," continued Mr. Robinson, "we have here on the isthmus machinery which had never been used before we began building the canal. A great part of the excavation is rock, and the wear and tear is enormous. Take our steel cables which are used on the Lidgerwood cars. The first we had would unload only about 200 tons and then break. We then got the manufacturers at work developing better ones, and we have now a wire cable that will unload 1,800 tons, or six times as many



Cutting Steel with a Blow-pipe



A Lidgerwood Train



Showing height of a steam shovel at Empire Col Deval at left

as used at the start. This last cable is expensive. It costs us 44 cents a foot; but it does the work."

Repairing Lidgerwood Cars.

We were walking through the car repairing shop when the above conversation occurred and Mr. Robinson stopped me to show me one of the new Lidgerwood cars. Those now used are a creation of Panama. The first sent down to the isthmus were like the common flat cars, and the heavy work here quickly reduced them to matchwood. Those now employed are mighty trucks with beds of plank so thick that they might almost form the logs for a cabin. The trucks are nine feet wide and forty feet long, with a heavy plank wall as high as your waist running along one side of them. The wall is backed by supports of hard wood and iron, and it is against it that the plows work when dragged by the cable to throw off the loads. Each car will hold forty tons, and some of the rocks which drop down upon them from the steam shovels weigh eight or ten tons each.

Others are so heavy that it is impossible to move them after they are on the cars, and they are broken off there with charges of dynamite. It takes heavy material and good workmanship to withstand such traffic, and the cars must be strong throughout. As I looked I saw some men laying a flock upon one of them. They used sixty-penny spikes, and drove them into the wood with a sledge. A little farther on they were repairing the steel cars which are dumped by compressed air. These have air tanks beneath them which are connected with the compressor on the locomotive. The engineer touches a button and the air shoves up one side of the car, and the great masses of earth and rock roll out on the ground. The doors of the steel cars are another improvement made down here at Panama. The wear and tear is so great that they have to be reinforced with seventy-pound steel rails. The cars are so strong that the rocks can be dynamited on the cars if they are too large to go through the door opening.

In the Locomotive Works.

All sorts of repairs are made on cars and locomotives here at Gorgona. The shop has a record of having repaired 12,000 cars in ten months, and at the same time having made heavy repairs on about 800 unloaders, 500 spreaders and 140 track shifters. It builds new rack shifters as well, and it is fully equipped for repairing locomotives and all other rolling stock. The locomotives as they come into the shops are stripped of their rods and other outside equipment. The next operation is to take out the driving wheels.

The shops have no large overhead cranes, such as we use in the states, so they have an invention of their own consisting of a drop pit above which the locomotives stand and the wheels are removed by compressed air. It used to be that the engines had to be jacked up, and it took several hours to get the wheels out from one engine. As it is now, a full set of wheels can be removed in thirty minutes. There are other arrangements for recutting the wheels, including great lathes which will gouge off one-fourth of an inch of metal at a time, the steel rolling off in curls like those of excelsior.

Cutting Iron With Acetylene.

Indeed, the iron-working machinery at Gorgona is wonderful. You can see every form of iron and steel creation. They have an iron foundry here, where they make about 700,000 pounds of casting in a month. The work is done by Jamaica negroes, under the superintendence of Americans. They have also brass foundries and everything connected with copper and tin.

In the iron works I saw them cutting immense blocks of steel with a blow-pipe. The flame was a mixture of oxygen and acetylene, and it melted right through the iron as though the latter were butter. I was told that the principle was that of the blowpipe, and that the pipe was fitted with a double nozzle, the first of which carried oxygen and acetylene and turned the iron to a red heat. The second nozzle carried a stream of pure oxygen, and this playing on the heated iron made it burn like wood. It was just like cutting a piece of pine with a red-hot poker, save that the work was more quickly done. The steel block I saw cut was about eight inches thick. The man who handled the blowpipe wore green goggles, incased in dust protectors, to shield his eyes from the flame. I photographed him at work.

Safecrackers Wanted.

As I saw this flame cutting into the iron I asked the engineers whether it would not be possible to use the invention in cracking a safe, and was told that the burglars who recently got away with \$15,000 in gold from one of the Panama banks had planned to do this on that job. They came here to

Gorgona and inquired how this flame was operated, and they had even ordered the oxygen and machinery for the work from the states, claiming that they were going to use it in cutting the girders of an old pier in Ecuador. The Gorgona engineers kindly showed them the process, and they were fully equipped for using it in that safe burglary. Indeed, the operating machine and the gases were found in the tunnel after they left. They had expected that the safe floor would be steel, and to use this for melting it. But the floor was only cement, and it broke down upon them before they knew it was coming. The result was that they rushed off with their gold, leaving the machine behind.

How to Beat Patentee.

During my visit to the Gorgona shops I went through the pattern department, in which Uncle Sam has about 40,000 patterns of machinery and parts of machinery. These patterns are estimated to be worth something like \$300,000. The models of all the inventions made by employees are kept there, and also those of the parts of the patented machines now in use.

The latter are used for repairing big machines, and that because of the great cost of repair parts. A machine itself may be sold at a profit of 15 to 20 per cent, while the repair parts for that machine are often sold at a profit of 100 or 200 per cent.

Now by our patent laws, if I am rightly informed here, a man has a right to use a patented machine as long as a bit of the original machine is left. He could build up the whole invention provided he used a bar, bolt or a nut of the patented article he bought and provided he did not have a greater number of such patented machines than he had actually purchased. Of course it would not be possible to tear up one machine and make a lot of new ones in this way, but one has the right to build up old machines provided he uses some of the original parts and does not create a greater number of complete machines than his purchases show. Uncle Sam finds it cheaper to make these new parts and repair the old machines rather than buy new ones or new parts. Moreover, it takes a long time to get material from the states, and he can manufacture his supply parts more quickly than he could get them from home. The ordinary time for the fulfillment of an order is ninety days, while the same machinery can usually be manufactured here in less than half that time.

In the Warehouses at Empire.

But let us take the train and ride down to Empire. We can get there in twenty minutes, and see the shop where the steam shovels and their parts are made new. We shall first enter the quarter-master's warehouse. There are eighteen of these on the isthmus, and each covers five acres. The one here at Empire is right near the shops, and is well worth a visit. It is divided up like a department store, being walled with shelves and cut up by aisles. It has hundreds of thousands of dollars worth of materials, embracing all the way from a nut the size of your little finger to a completed ninety-five-ton steam shovel as tall as a haystack.

The yards outside of it are full of car wheels and of steam shovels being repaired. I stand beside one of the great shovel buckets to show you its height. It will hold five tons of rock. Nearby are rolls of wire cable and heavy machinery, barrels of insulators for electrical use, and great piles of poles, used for tamping the dynamite. The steam shovels now on hand are worth something like \$100,000 and their repair parts are as delicately made as the pivots and wheels of a watch. They must be exact to prevent the great machines from destroying themselves.

We have now on the isthmus more than one hundred shovels and from ten to twelve are sent in for repairs every month. They are mighty machines which will take up from five to ten tons of

Green Gables
DR. BENJ. BAILEY
SANATORIUM
Lynch, Va.

This institution is the only one in the central west with separate buildings situated in their own ample grounds, yet entirely distinct and rendering it possible to classify cases. The one building being fitted for and devoted to the treatment of noncontagious and nonmental diseases, no others being admitted. The other Rest Cottage, being designed for and devoted to the exclusive treatment of select mental cases, requiring for a time watchful care and special nursing.

earth and rock at a bit, and each represents the work of 500 men. Ten steam shovels are equal to 5,000 masonry, it can therefore see how necessary it is that the repairs be made upon time. Each shovel cost many thousands of dollars, and the destruction of one means a great loss. Some have been ruined by being caught in the slides, but nevertheless have been taken out and repaired.

This was so with shovel No. 23, which weighed ninety-five tons. It was a complete wreck when it was pulled out of the slide at Cucuracha, and the trucks were not recovered until weeks after the main part of the machine had been brought to the shops. Nevertheless all the parts were brought finally together and the whole was overhauled and rebuilt and again put to work.

Among the interesting features of Empire are the air compressors which are supplying about three hundred million cubic feet of pure air every month. There are three of these plants, one at Cascades, one at Rio Grande, and another at Empire. They feed a huge pipe which runs from one end of the Culebra cut to the other, and through other pipes supplies the air for the drills and other pneumatic tools, hobs and also the shops. They are now working 130 drills. This compressed air is taken through a complicated system of pipes, much of which has to be taken up and relaid every month. The main pipes of both air and water run along each side of the cut, and they are carried across the cut from one bank to the other on a bridge not far from Empire. It takes about 200 men to keep the piping and water service in order, and the pipes have to be watched night and day for leaks and breaks.

White Ants and the Canal Bridge.

And just here I must tell you how near a very small thing came to delaying the canal construction, and thereby costing Uncle Sam many thousands of dollars. You may have heard of the white ant. It is not as long as your finger nail, but it came within an ace of holding back this work and laying off for a time thousands of men. It did this in connection with the suspension bridge which crosses the gorge from one side to the other. The air and water mains are carried across on this bridge, and had it fallen they would have broken and it would have taken weeks to have repaired the damage.

Now this bridge was thought to be strong. The piers at its sides were made of a combination of steel and wood, and the parts which upheld the cables were of oak in order that they might be found in fact the key to the work. Not long ago it was thought they had best be examined, and a man climbed to the top. He found that the white ants had been eating the oak, a wood of which they are especially fond, and that they had gotten so far that within a few weeks longer the timbers would have crumbled to dust, allowing the bridge and pipes to fall into the cut. It is needless to say that repairs were immediately made and that in such a way as to prevent any danger from these insects in the future.

FRANK G. CARPENTER.

Cruel Realism.

John G. Johnson, the famous lawyer and no less famous art expert, was talking at a dinner in Philadelphia about some of Sargent's cruelly realistic portraits.

"Sargent once painted a Philadelphia woman," Mr. Johnson said, "and when the work was finished the lady's coachman called for it.

"As the coachman was studying the portrait, Sargent said to him:

"How do you like it?"

"The man answered thoughtfully:

"Well, sir, ye might have made it a little better looking, mebbe, but if ye had ye'd have spoilt it."—St. Louis Globe-Democrat.

Plans Were All Made.

Society Reporter—I hear that you are making plans to get married in this country.

Count Nogoodsky—Ah, what shall I say? Making ze plans? No, no! I haf had ze plans prepared ze long time. I am now busy—what you say—taking ze estimates.—Judge.

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