

### How Ships Will Be Lifted Through the Canal By the Aid of Electricity.

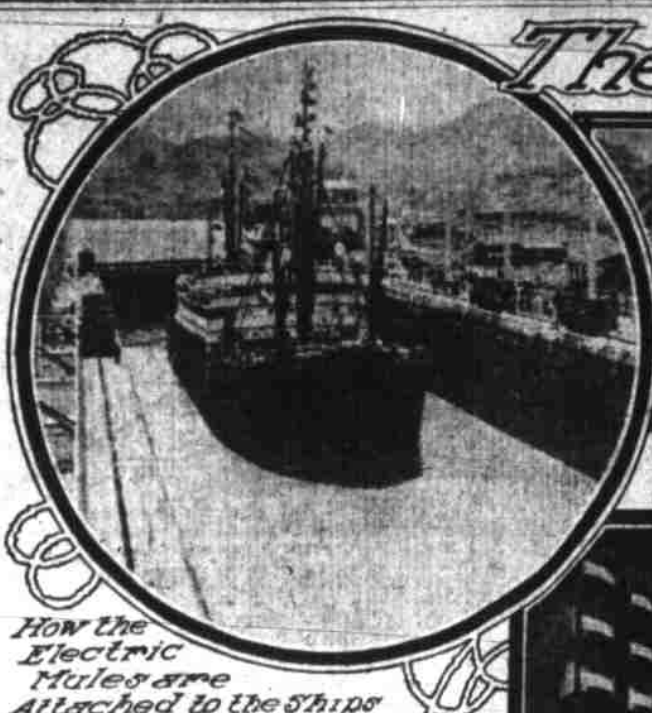
THE Panama Canal is finished. The greatest engineering project of history is an accomplished fact. The predictions of the pessimist have not materialized and the hopes of the optimist are about to be realized in the success of one of the greatest commercial time and money savers of modern times. The climate and physical difficulties were overcome through the energy, devotion and skill of the engineers. The gigantic machinery used was in keeping with the hugeness of the task and although a casual observer might marvel at the apparatus used, with which this machinery worked and at the tremendous results it accomplished, yet a proper appreciation of its usefulness could only be had by knowing something about the mechanism of the great tools and implements, and the obstacles which lay hidden in the pathway of their work. But the day of the machine is not over, as it will play an essential part in the operation of the waterway and the mechanics of the Canal is an interesting subject even to those who may not know or appreciate the scientific principles underlying their application.

#### Gigantic Fender Chains.

No vessel will be allowed to enter or pass through the locks under its own steam. When a ship arrives at either the Gatun or Miraflores locks, it is taken in charge by the Canal authorities who at once send two representatives on board to remain, one on the bridge, and the other in the engine room, until the ship has passed out of the locks. The first safety device is the huge chains which stretch across the locks. They are placed there for the purpose of preventing a vessel which might enter the locks too rapidly from jamming the gates. The chain weighs 24,000 pounds and is capable of stopping a 10,000 ton ship while it is moving at the rate of four miles per hour. The chain is operated by hydraulic machinery in the walls and plays out slowly by automatic release until the vessel is brought to a stop. When a ship is ready to enter the locks and has come to a stop, the chain is dropped into its groove in the bottom of the Canal. In case the ship should by some means break the chain, the first gate might be jammed, but this would not affect the lock as the first gate is merely a safety device.

#### Electric Mules.

When all is ready for passage, the electric towing locomotives, known as "electric mules," are attached to the ship; two in front, one on each wall to pull the vessel, and two astern to keep it in a central position and to bring it to rest in the lock chamber. The powerful machines are equipped with a slip drum towing winch and hawser which permits the towing line to be paid out or taken in without



How the Electric Mules are Attached to the Ships

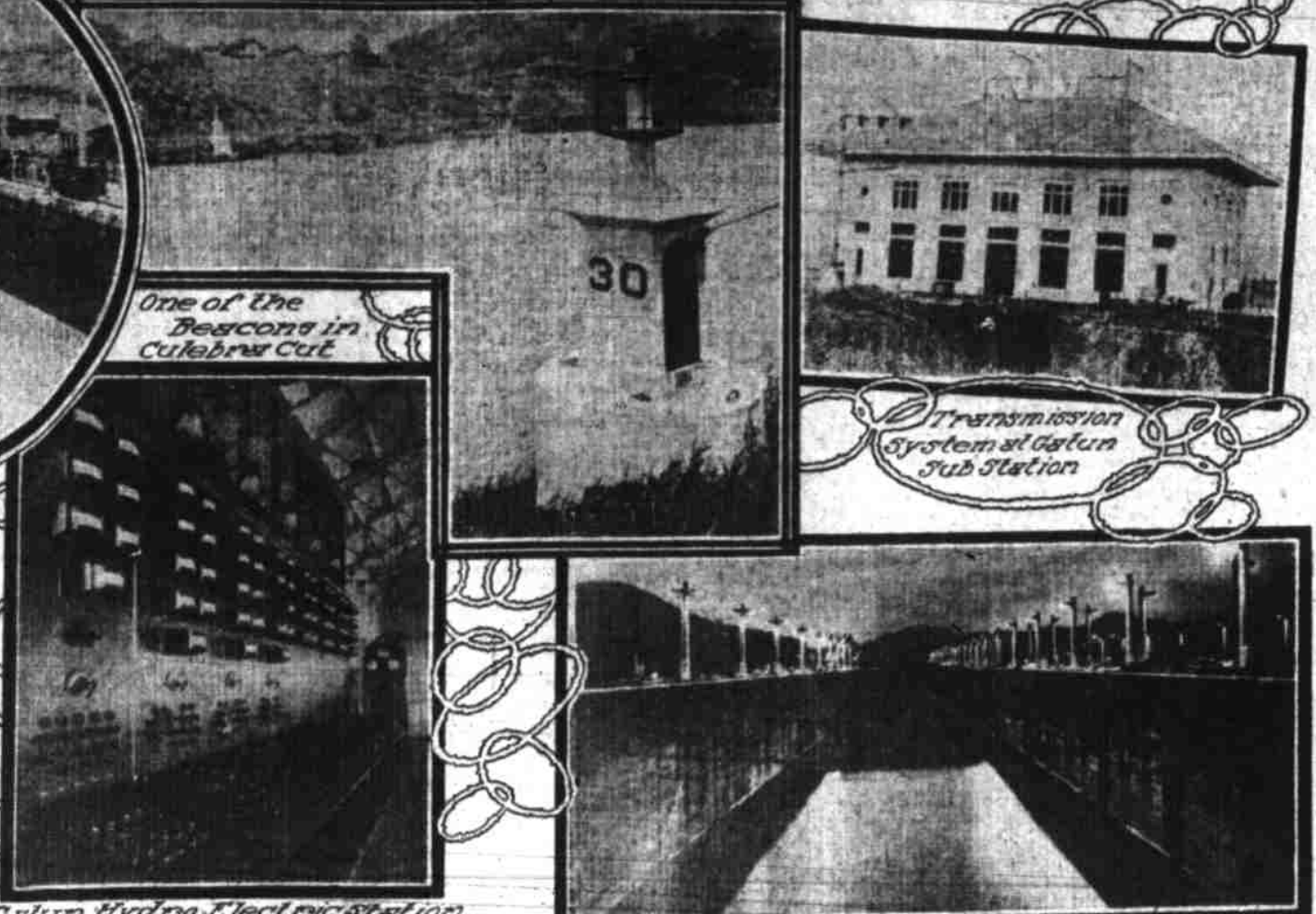
actual motion of the locomotive on the track. The "mules" when towing operate over center cogs and climb from lock to lock on rack rails. When the gates swing open the vessel is towed into the lock and the gate closed behind it. The water is then let in lifting the vessel to the level of the lock above.

#### Gate Machinery.

The machine used for opening and closing the gates is a simple and powerful machine. It is the invention of one of the mechanical engineers in the employ of the commission, who describes it in the following manner:

"It consists essentially of a crank gear to which is fastened one end of a strut or connecting rod, the other end of which is fastened to a lock gate. The wheel moves through an arc of 117 degrees, closes or opens the gate leaf, according to the direction in which it is turned. One operation takes two minutes. The crank gear is a combination of gear and crank, is constructed of cast steel, is 19 feet, 2 inches in diameter, and weighs approximately 35,000 pounds. It is mounted in a horizontal position on the lock wall, turns on a large center pin and is supported at the rim in four places by rollers. The center pin is keyed into a heavy casting anchored securely to the concrete. The crank has gear teeth on its rim and is driven through a train of gears and pinions by an electric motor in a contiguous room. The motor is remotely controlled by an operator who is stationed at a center control house near the lower end of the upper locks. A simple pull of a small switch is sufficient to either close or open a 730 ton gate, the operation being perfectly automatic." A strut anchor connects this with the lock gate at the top. The great gates weighing from 390 to 730 tons are opened and closed with as much

## The Mechanics of the Canal



One of the Beacons in Culebra Cut

Transmission System at Gatun Sub Station

Gatun Hydro Electric Station Front View of Control Switchboard

Gatun Locks at Night

case as the opening and shutting of an ordinary gate or door.

Another safety device is what is known as an emergency dam. It looks like a big cantilever bridge and is so placed that it can be swung across the lock entrance in a few minutes. This would only be used in case the chains should break and the outside gates fail to hold. From this will be seen that "safety first" has not been neglected along the Canal.

#### Hydro Electric Station.

All the workings of the locks will be manipulated by electricity, the current for all being generated at the hydro electric station at Gatun Spillway. The gate control house at the spillway, the four substations of the transmission system at Gatun, Miraflores, Cristobal and Balboa and the three-lock control houses comprise the principal buildings connected with the actual operation of the canal. The big station at Gatun Spillway shelters the turbines which will generate the power for the operation of the machinery at the locks, machine shops, dry docks

pumping plants and coal handling stations. In addition it will furnish light for the Canal and the Zone Towns and if desirable the power for the electrification of the Panama railroad. The building on the inside has four principal elevations, a pit for the three 2500 K. V. A. turbines, a main floor and two galleries. The turbine pit is about six feet below the level of the main floor and is reached by an iron stairway. Everything around the machinery must be kept clean, so enamelled bricks are used and the least dirt is soon shown and will be removed. The main floor is devoted to the electrical equipment. The hydro electric station receives its energy from the water taken from Gatun Lake and discharged into the lower spillway channel and has a power of 6000 kilowatts. The substations are almost as interesting as the parent station with their mysterious looking buttons and levers. Here again we find the safety first as there is a steam plant at the Miraflores Station which can be used in the event of a failure of the hydro

electric station.

#### Lock Control Board.

These great electric houses contain the very latest and best electrical instruments so far devised by man and are controlled by expert electricians. At each of the locks a man has before him on a table a control board about sixty-four feet long and five and one-third feet wide. Standing in front of this board, the man throws the switches, and in response to his action the fender chains rise and fall upon the models before him, the gates open and close and the water rise or fall just as he may desire. He knows the exact position of the ship as it climbs the stairway in its trip from the Atlantic to the Pacific.

A system of interlocked levers will prevent him from doing the wrong thing in handling his levers. This is arranged in such a way that certain levers will not work except in connection with others and they must be pulled in rotation. This makes it next to impossible to err, but in case some-

thing should go wrong a near by switch will cut off the power entirely.

During the passing of a ship through the Canal it will be necessary to lower and raise twelve fender chains and to shut and open dozens of valves weighing several tons. Twenty-three lock gates must be opened and closed, an aggregate weight of more than 25,000 tons.

One man in a building on the top of the center wall of the locks directs and controls the operation in the passage of a ship except the movements of the towing locomotives. He sets in motion no less than eighty-two motors at Gatun alone twice during the lockage of a ship. Yet so completely has the system been worked out and each movement is so perfectly dovetailed into the other that an accident seems well-nigh impossible.

#### Lighting.

The lighting of the Canal is an important item and this like everything else is on a gigantic scale. Electricity from the Gatun Spillway Hydro-electric Station lights up every

### "Safety First" Is Shown In the Locking System From Beginning To End.

part of the Canal where electricity can be used but in towers and beacons in inaccessible places compressed acetylene, dissolved in acetone, is used. While lights are used throughout and in order that there may be no confusion of lights with one another and with the lights on shore, the beacons, buoys and range lights will have individual characteristics by certain kinds of combinations of flashes with dark intervals.

The range lights vary according to the length of the range, from about 2500 to 15000 candle power, the most powerful being those marking the sea channels at the Atlantic and Pacific entrances, which are visible at least twelve miles.

As vessels may pass through the locks in the night a peculiar kind of illumination has to be used about the locks. The glaring brilliant unshaded light would blind the vision of the pilot and be almost as bad as no lighting at all. After many tests of lamps large Tungsten bulbs (500 Watt) were selected. These are placed inside a concrete hood which serves both as a shade and reflector. Clustered under the concrete hood the lamps are suspended from brackets which are placed near the tops of heavy concrete columns twelve sided and tapering from three and one-half feet at the base to one foot at the top. Their total height being about thirty-four feet including the two foot concrete ball at the top. They are so arranged that on moonlight nights they will burn with only half their power.

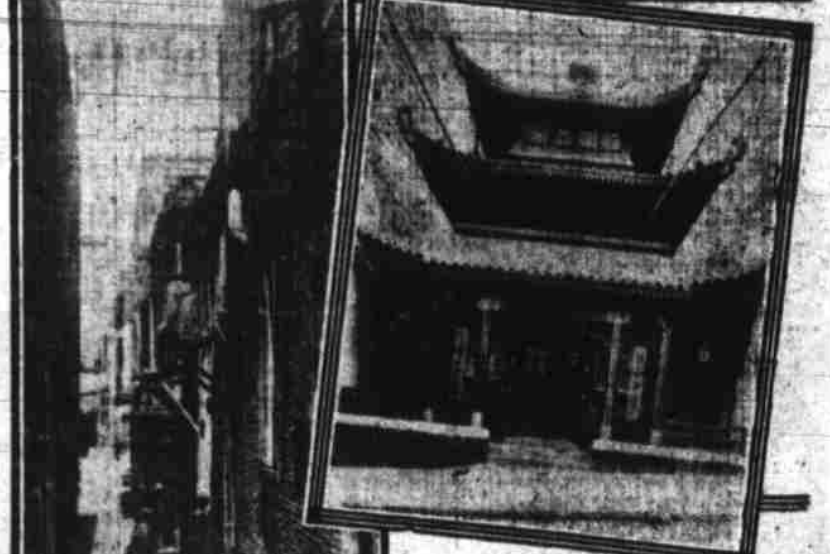
#### Electric Driven Tools.

All the machinery at the big machine shops will be operated by electricity and the oil pumps will have the same motive power. Many of the levers used in the repair shops will be driven by individual motors. Every conceivable kind of work is being done in these shops ranging from the handling of a most delicate watch spring to the overhauling of a locomotive.

Two powerful floating cranes "made in Germany" are to be used for Canal requirements and general wrecking purposes. They each have a capacity of 150 tons.

Barges, lighters and harbor tugs will always be on hand when needed. A tender for passengers and mail is also contemplated. Big dry docks are in the course of construction, the main one being large enough to accommodate any vessel which can pass through the locks. Vharves and storerooms with all the necessary equipment for handling freight are already in working order. Everything has been done on a large scale and ships can be handled without loss of time. Nowhere else does one find such gigantic machinery yet so perfectly arranged that accidents are practically impossible. "Safety" is written all over the mechanics of the Canal.

## FRISCO'S NEW CHINATOWN



The Chinese Father is as Devoted to his Children as the American Parent

And the Chinese Mother Just as Curious as her American Prototype

Mr and Mrs. Wong San Yue Clemens in their Carve Shop

One of the Narrow Streets of the New Chinatown

The Artistic Chinese Telephone Exchange

### With Its Oriental Architecture and Coloring It Forms the Most Interesting Section of the City of the Golden Gate.

WHEN the disaster of 1906 swept over the City of the Golden Gate it wiped out Chinatown so completely that many people declared this bit of the Orient was gone forever. These prophets were from the East, for the native of San Francisco will never acknowledge himself beaten no matter how great the calamity. Nor was he beaten in this instance, for Chinatown was rebuilt on the same spot and on a much grander scale, yet without losing any of the exotic coloring for which the old town was so noted. Always mysterious, with its weird sounds coming from behind closed doors, it possesses a charm for the tourist not to be found elsewhere in this country. There is an inexplicable fascination about this odd corner of the California metropolis where several thousand Chinese live just as they did in far away Canton or Shanghai.

pages of the San Francisco telephone book is given over to the Chinatown Exchange, the names and addresses being printed in Chinese characters. Four Chinese newspapers are printed in the town, and they put out bulletins several times a day—queer strips of yellow paper covered with Chinese letters, resembling a huge laundry ticket.

urhine. Many of them are gorgeous little creatures with their yellow silk jackets fastened across the breast with silk loops and their lavender pantaloons tightly bound around the ankles. Sometimes one sees several of these little almond-eyed creatures toddling along after their mothers—a perfect picture of unconscious contentment. The little girl, too, with their funny broad, flat noses and narrow eyes run about the streets and talk in queer little piping tones. They are dressed like their mothers except their clothes are of gay colors and they wear silver bracelets on their ankles. The men, too, lend a picturesque touch to the scene so uncommon to the average American. They are garbed according to the nature of their business.

**Banks, Telephone Exchanges and Stores.** They have their own banks which have connections with the banks in China, and the reports of these institutions show them to be in excellent financial condition. Their telephone exchange is one of the most artistic buildings in San Francisco. It is typically Cantonese both in structure and workings for the switchboards are operated exclusively by Chinese girls who speak English as fluently as they do their own language. About ten

**Street Scenes Interesting.** It is not the business of Chinatown, however, which attracts the visitor—it is the Chinese themselves. The writer has sat for hours at the window of one of the quaint tea houses of the town and watched the endless throng of celestials with a never-ending delight. The women and children are, as usual, the most interesting. Few of them have adopted American clothes and with their loose black pantaloons showing below the shiny black gowns, the effect is rather startling at first but one soon becomes used to the garb. The Chinese matron is usually a roly-poly sort of person who wears her shiny black hair brushed back over the tops of her ears and neatly rolled up in a knot at the back of her head and fastened with a gold pin or jade ornament.

**Big Bazaars.** The big bazaars have marvelous displays of bric-a-brac, silks, embroideries, antique lanterns, lacquer ware, carved ivory, sandal wood fans, China ware of the most exquisite workmanship, ramphor wood chests, Cinnamon, Siam, Canton ware, kimonos and Mandarin coats which send the female shoppers into ecstasies. The drug stores are sure to attract attention for they display such articles as sharks' eggs, dried toads, sliced deer horns and other uncanny remedies for diseases and the casting out of evil spirits—more, perhaps, for the benefit of the tourist than for medicinal purposes, for Chinatown has some really excellent medical men who



The Chinese Letter-Writer

use the same remedies as the American physician even if they do display the Chinese panacea for all ills. At one shop pills are advertised to cure the opium habit.

#### Tea Houses Delightful.

The tea houses, however, are delightful in their wealth of carved teakwood and their odor of incense. There one revels over real tea, rice cakes, preserved kumquats, ginger, candied coconut strips, lichi nuts and all sorts of Chinese sweets. Coming out of these places the visitor is sure to encounter the sidewalk shoe cobbler who sits on a little bench on the sidewalk and mends shoes while you walk. The Chinese letter writer, too, piles his trade on the sidewalk and writes letters of all kinds for a mere song. He is a Chinese institution and exists

#### wherever Chinese reside.

Across the street is a fat Chinaman trying to sell another Oriental string of dried shrimp and the two seem to be bargaining over the price. A closer examination of the store shows strings of mottled brown and white sausages, glazed roast duck, cakes of bean cheese and meats prepared in ways uncommon in America. All sorts of vegetables are on sale as well. The Chinaman is especially fond of cucumbers and white radishes, and these seem to predominate at the green grocers. Blinks of green sugar cane are sold to the children just as a stick of licorice root used to be a favorite "chew" for the American school children.

#### Best Time To See Town.

Night is the best time to visit the

ing anvils, accompanied by a squeaky violin.

#### American Women Interesting.

No write-up of Chinatown, either the old or the new, would be complete without the mention of Mrs. Wong San Yue Clemens, the American woman who married a Chinaman several years ago while she was doing missionary work in the old Chinatown. The writer met this lady a few days after the earthquake and fire of 1906. She was a fair haired, well educated woman of refined tastes and a sister of Katherine Clemens who was at one time the wife of Howard Gould. She did excellent work during those dark days, for had it not been for her good offices many of the Chinese would have starved to death. They have a remarkable collection of relics of the San Francisco fire. The collection, many of them freaks of the fire, forms an interesting study of the effect of the various degrees of heat on different objects. One of them is a milk bottle—the one delivered at the door on the morning of the fire. It sat on the doorstep filled with milk and became a prey to the flames. Somehow the milk and glass melted during the great heat and it came out of the fire a perfect specimen of Tiffany glass.

#### Theatre Unique.

The theatre is unique as all the characters are taken by men and their attempt to impersonate women is a perfect burlesque although they consider it serious work. There is no scenery. A table will serve for a mountain and a piece of wood for a forest. All plays have one character who must ride horseback, and he usually comes in astride a broomstick. Frequently one of the cast is beheaded after which he gets up and solemnly walks off the stage. The play sometimes continues for days and even weeks. The music which continues from the beginning to the end of the show is a clatter of brass and clang-

ing anvils, accompanied by a squeaky violin.

The structures while erected on modern American plans still preserve all the features of Chinese architecture in their queer shaped roofs, balconies and lantern lined balconies. The underground passages and the opium dens of the old town seem to have vanished. Of course, gambling goes on to a certain extent, but the stifling subterranean dens of the old town have not been rebuilt. The white slave traffic which used to flourish there has been wadded out. It is a cleaner, better Chinatown and to the most fascinating section of cosmopolitan San Francisco, for it is like a bit of far away China transplanted upon American soil.