

The Smallest Public Service Plant in the Country

By George Frederic Stratton

THE smallest hydro-electric station in public service is in the gulch of a torrent which races down through the Little Cottonwood Canyon in the Wasatch Range in Utah. But its diminutive size is by no means its chief distinction. It is a municipal power-plant, built and operated by a city of 4,000 inhabitants, and as an illustration of what clean, municipal enterprise and management can do, it is claimed to be without a parallel.

Placed in operation but a few weeks ago, it has excited very great interest and very close scrutiny from small towns all over the West where water powers are obtainable for development, and from many other towns where steam power would have to be used.

For several years this little city of Murray had been served with electric lights and power by a large producing company, but there was water under tremendous headway coming through that canyon and running over the bench lands for irrigation. Very evidently great economy was the spur, and the city raised \$80,000 and built this plant.

Arrangements were easily made with the irrigation water owners to use the power running to waste, and the house was built in the foothills two miles from the canyon mouth. The intake and dam are a half mile up the canyon, and the fall from the dam to the turbines is over five hundred feet.

From the intake to the house the water is conducted through a 30-inch wood stave pipe. There are two turbines and generators, each of 600 horse-power, and which can be operated as separate units or together. The current is generated at 2,300 volts; stepped up to 6,600 volts for transmission over the six miles of wires into the city, and there it is reduced again to the proper voltage for either power or light.

When that little city was buying its current for street-lighting and water-pumping the cost was close to \$300 per month. Now that cost is entirely cut off. Not one dollar per month needs to be charged up to that public service, and although the income from the citizens for house lighting and power pays all operating expense, the rates to them have been astoundingly reduced. The lighting rate has been cut from 10 cents per kilowatt hour to 7½ cents; the rate for cooking and heating from 5 cents to 2 cents per kilowatt hour; and the rate for power is now 2 cents, against a former rate of 14 cents. On large, steady quantities of power, on day-load only, contracts are offered at less than 1 cent per kilowatt hour. In fact, 100 horse-power can be secured at a flat rate of \$150 per month. As far as is known, no current is offered so cheaply by any plant, even in the great region of the innumerable water-powers of the intermountain country.

And, after passing through the turbines, the water runs into the irrigation canals. Not one pint of it is lost or wasted.

The operating force consists of a manager, whose office is in the City Hall, and who looks after the sales and distribution; two attendants at the power-house—one on day duty, the other on night; and an occasional intermittent inspector of the pipe-line and dam. There is no reservoir; a small covered settling basin serving every purpose, for those canyon streams, fed all through summer by melting snows on the high peaks and deep ravines miles back and up in the mountain range, never fail.

Electric Speed Indicator for Locomotives

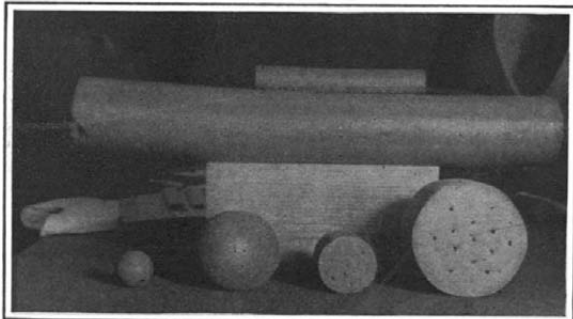
A NEW speed indicator for locomotives employs an electric system consisting of a small alternating current dynamo run from the axle, whose speed is proportional to the axle speed. The alternator sends current into an electromagnetic apparatus containing a set of small metal tongues or reeds placed opposite a magnet, the reeds being tuned so that only one of them enters into vibration, according to the rate of pulsation of the electric current. Alongside the set of reeds is a scale with figures, so that when any particular reed is seen to vibrate, the figure is read off, and this gives the rate of the

current vibration, or in other terms, the number of revolutions of the locomotive wheel or the speed of the locomotive on the track. A suitable chart allows of direct reading the speed in miles an hour.

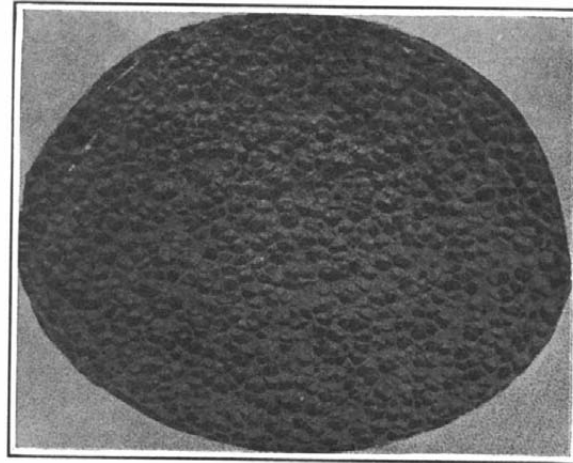
Rubber Foam

By Paul James

WHILE all the other parts of automobiles have been brought so nearly to a state of perfection that it is possible to travel thousands of miles without



Small cylinders and sphere of unvulcanized rubber transformed into large cylinders and sphere of rubber foam.



Rubber foam as it appears in the microscope.

making repairs, the rupture and bursting of the pneumatic tires still constitute sources of delay and accident. None of the many spring devices proposed as substitutes for pneumatic tires has given good results in practice. A good pneumatic tire should be both flexible and elastic. India rubber is flexible enough, but it is not sufficiently elastic.

The solution of the problem appears to be furnished by a new material of remarkable properties, which is produced by an ingenious process in Paris. This product consists essentially of India rubber containing multitudinous minute bubbles of gas, distributed throughout its mass. The material resembles a rubber sponge in which the cavities are separate and do not communicate with each other. Hence it has received the name "*caoutchouc mousse*," or rubber foam.

The process of manufacture is based on the increase of solubility of gases with increase of pressure. Rubber in the pasty stage of vulcanization is inclosed in a steel

tube with nitrogen at a pressure of 3,000 to 4,000 atmospheres. The compressed gas dissolves in the semi-liquid rubber, which, when the tube is opened, expands to four or five times its former volume and solidifies, imprisoning in its mass myriads of little gas bubbles, so that it resembles, in structure and properties, an assemblage of tiny rubber balloons.

The material, in fact, combines the properties of its two ingredients. It is as flexible as rubber and as compressible as a gas, so that it may be employed, in the form of a solid ring, in the place of the air tube of an automobile or bicycle tire. A tire so constructed is non-collapsible, for a puncture affects only a few of the innumerable gas bubbles.

Another valuable property of rubber foam is its lightness. Its density varies from 0.4 to 0.17, according to the quantity of gas forced into it. Hence, it is an excellent material for life-preservers and small folding life-rafts. It is also a very suitable filling for cushions and chair seats, and especially for horse collars, as it is light, imputrescible, and does not scratch or gall the skin if the cover is broken. It is also used in shoe soles, tennis balls, etc.

Rubber foam possesses still another valuable property. It is the best heat insulator known, and about twice as efficient as its nearest competitor. It has already proved its excellence as a lining for ice-boxes and refrigerating apparatus. Ordinary glass bottles, covered with a layer of rubber foam, keep liquids hot or cold.

Three-letter Linotype Matrix

A RECENT invention offers a new linotype matrix and attachment for the vise making the matrices three-letter instead of two, thereby saving the printer money in matrix fonts, and also in the time now used in changing magazines to obtain additional type faces. Three different faces of type, of any size up to and including 12-point, may be cast from one magazine without lessening the operator's speed in the least. Faces Nos. 1 and 2 are obtained in the ordinary way through the assembler, while a touch on the button on the vise gives the third face. Double-deck machines, having now four type faces, with this invention may carry six, three-deckers nine, and multiple-magazine machines twelve different type faces. Many job plants have only a dozen different faces in common use. The device permits the use of two type faces, besides the body type of any publication, from a single magazine. All that is necessary to make the change on the ordinary linotype of any model is a slight change in the attachment on the vise and on the mold. Any machinist can do the work in a very short time. No change whatever is made in the assembler, the lines being assembled exactly as with the two-letter matrix. Another advantage is found when it becomes necessary to recast lines. Now, on work where black and light faces are needed, lines must be reset or reassembled. With the three-letter matrix the lines may be recast without resetting. Many double-deckers in newspaper offices are used at a disadvantage because of the lack of a third face. The inventor is Mr. J. A. Quinn, of New York city.

A New Use for Concrete

IN building a ferry landing stage at Sydney, Australia, a big pontoon made of reinforced concrete was adopted. It was 100 feet long, 68 feet wide at one end and 43 at the other, and 7 feet 9 inches deep, giving it a freeboard of 32 inches. The bottom was flat, and the sides and ends were given an inclination of 70 degrees. The pontoon was divided into 48 water-tight compartments, and was carefully reinforced and strengthened to withstand the pressure of vessels lying alongside. A live load of 150 tons is provided for, and the structure weighs 650 tons. It is expected that this concrete structure will require little attention in the way of repairs, will be permanently water-tight and will overcome many other troubles that the ordinary wooden or steel pontoons are subject to.

Compound Railroad Tie

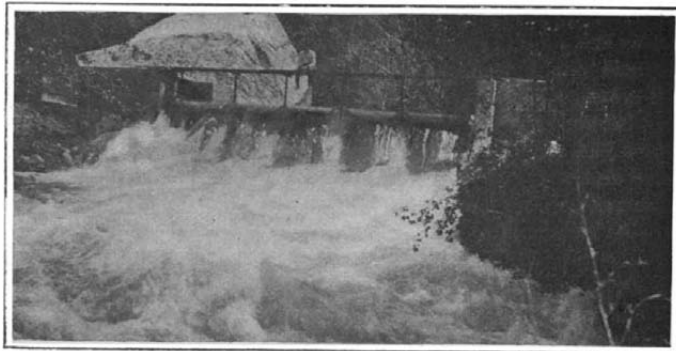
—A railroad tie in which a metallic jacket is shrunk upon a wooden core is shown in patent, No. 1,102,693, to Charles L. Seyler, of Academy, W. Va.



The 30-inch wood stave pipe.



The 600 horse-power generating plant.



The dam in Little Cottonwood Canyon.

Motorcycle Machine Gun

THE designer of the new fighting machine shown in the accompanying photograph is Quartermaster-Sergeant H. R. Northover of the Ninetieth Regiment of Canadian Militia. The motorcycle with Maxim gun mounted on a sidecar chassis has a greatly increased radius of effective action as compared with other artillery. It can travel four miles per hour (the pace of infantry march) or be hurried to a distant point at a rate faster than forty miles per hour.

In the maneuvers at the barracks, when word was received that the Ninetieth Regiment probably would be in the first division from Canada to be sent to Europe, the motorcycle artillery was driven for two and one half hours through lines of people extending from the sidewalk to the middle of the road; it traveled through water and plowed fields; it went everywhere with the rest of the artillery. The chief advantage, however, of the motorcycle Maxim gun is its superior speed, compared with other artillery, and the rapidity with which it can be mobilized where needed for effective action.

Reconstruction of the Kiel Canal

IN 1895, after eight years of hard work, the great canal running from the mouth of the Elbe, in the North Sea, to the Fjord of Kiel, in the Baltic, a distance of about sixty miles, was thrown open to commerce. It had a normal width of 72 feet at the bottom and 220 at the water level, with a depth of 29½ feet. Although a sea-level canal, twin locks were built at each end, those at the western entrance to take care of the large tide variations, and those at the eastern end to take care of variations of water level, in the practically tideless Baltic, due to gales. The locks were 492 feet long, 82 feet wide, and 32 feet deep. The locks at Kiel remained open most of the time, while those at the mouth of the Elbe did not need to be used at certain tides.

The canal proved wonderfully valuable to commerce, because it saved the long, hazardous trip around the stormy coasts of Denmark. But its strategic value to the German navy was of even greater importance, as has been demonstrated in the present war.

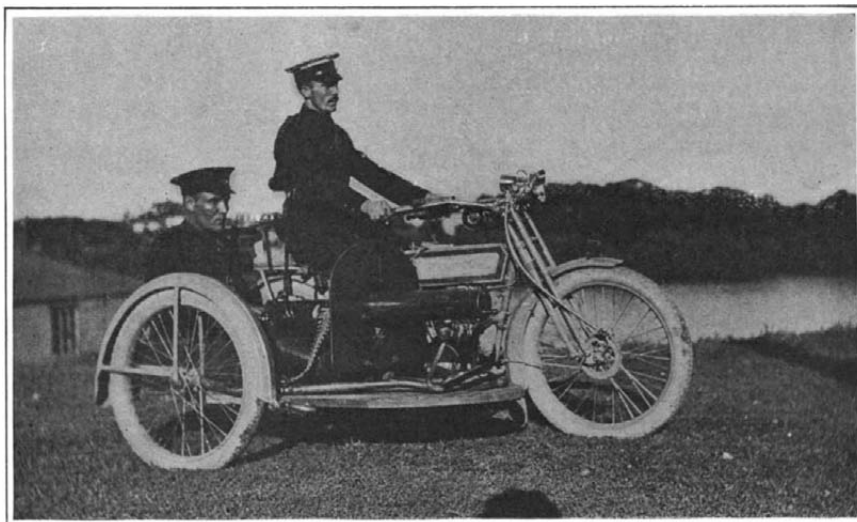
Although the locks, when built, were large enough to take almost all vessels, they were outgrown in time, even by warships, and finally it was decided to reconstruct the canal, making it broader and providing locks that could take the largest vessel afloat, with plenty of room to spare. This work was completed in time to be of incalculable value to Germany in the present war.

The normal width of the canal is now 335 feet at the surface and 144 at the bottom, with a depth of 36 feet. New twin locks have been built alongside the old ones at each end. They have an available length of 1,082.6 feet and width of 147.6 feet. Intermediate gates may be used to cut off a chamber 328 feet long. The locks at Panama, it will be recalled, are only 1,000 feet long by 110 feet wide.

The work of reconstructing the canal cost \$55,000,000. The new locks were formally opened by the Kaiser, recently, in the manner shown in the accompanying illustration. The royal yacht "Hohenzollern" may be seen breaking a ribbon of black, white, and red stretched across one of the new locks.

Draft Dogs in War

DOGS have long been used in the European armies for carrying messages from an advanced post or patrol to headquarters, for watching supplies and the like, for assisting sentinels on the advance lines, and for similar purposes. Shortly before the beginning of the present European conflict, dogs were introduced in the Belgian army as draft animals. American tourists who are at all familiar with Belgium will no doubt recall that dogs are used by the peasantry for the hauling of light loads. It is perfectly natural, then, that the Belgian military authorities should use dogs for the transportation of light machine guns. An interesting article on this subject appears by Capt. Oefelee in a



A motorcycle machine gun.

late number of *Umschau*. "In all armies but the Belgian," says Capt. Oefelee, "machine guns and their ammunition are transported either upon ordinary vehicles drawn by horses or upon the backs of mules and horses. Belgium, which introduced the machine gun only this year, has built specially light vehicles for the transportation of the weapons and their ammunition. The first experiments were made with a single company. They were so successful that it was decided to adopt dogs for the

drawn by two dogs. The load which can be thus transported is about 420 pounds.

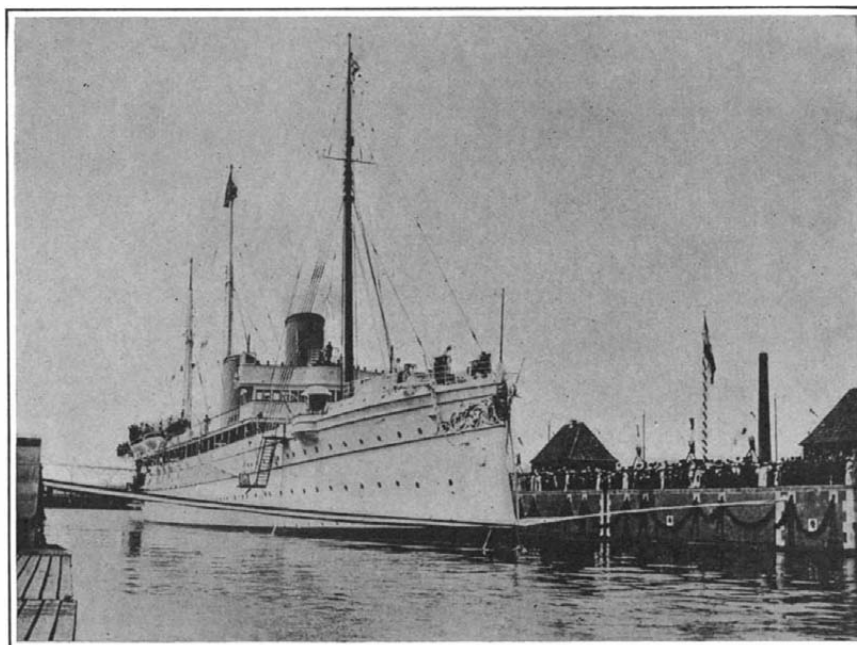
The dogs must not be too heavy. They must be strong and possess considerable endurance. Dark colored dogs are preferred, because they are less conspicuous than light dogs. Still it has been found in practice that even yellow dogs may be used, if they are not too brightly colored. It is very essential, indeed, that the dogs should be anything but combative, and that they must not be given to barking. Hence, they must be trained, from puppyhood up, to silence.

In Holland experiments have also been made for the transportation of machine guns by draft dogs, in accordance with the Belgian system. A march of 129 kilometers (77.4 miles) was made in five days, the men, of course, traveling on foot. At night the dogs were fed and slept in stables on straw. They did not suffer at all. After this performance came the regimental exercises. Every day, from seven in the morning until four in the afternoon, the men were put through the usual drill. The dogs showed not the slightest sign of fatigue. They hauled the guns over very difficult ground and were always in position when wanted. While the guns were being fired, they lay quietly on the ground, and were ready on the first signal to haul the guns away to new positions.

During the autumn maneuvers of the Dutch troops the animals aroused general admiration. Their endurance and their obedience were remarkable. As soon as the command "Halt" was given or an equivalent signal, the dogs dropped to the ground of their own accord. They had been trained so well that they did not bark either during the maneuvers or during the night. After the maneuvers it was thought that they were probably fatigued. The inspector found them playing with one another. They were transported by railway with the machine guns in the same compartments in which the men sat; but although the railway journey lasted from 5 o'clock in the afternoon of one day until 1:30 the following morning, and the dogs were not fed in the meanwhile, they showed no signs of fatigue. They were inspected again fifteen days after the maneuvers, and were again found to be in perfect condition.

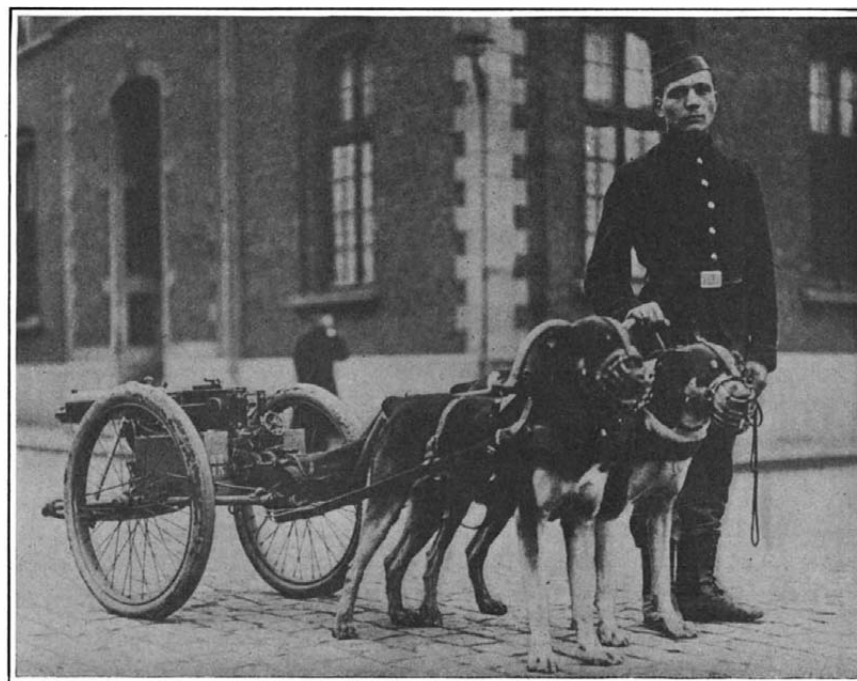
Animals and Approaching Earthquakes

THAT animals are sensitive to the approach of earthquakes is a fact frequently observed, and the more recent seismic troubles in various countries give numerous examples of this singular faculty which many animals possess. For instance, in Japan horses set up an unusual agitation whenever a seismic shock is near at hand. In Central America, dogs and cats flee from houses, and the inhabitants have become so accustomed to this that they follow the example of the animals and leave their dwellings so as to escape danger. In Italy it was observed that birds left their nests and flew up to a great height in the air, but this without noise, before the earthquake took place. However, at the time when the earthquake shocks were produced the birds uttered cries which lasted for all the duration of the earthquake. It is stated that in Sicily cocks crow and dogs howl just before an earthquake.



The "Hohenzollern" breaking a ribbon of black, white and red, at the opening of the new Kiel Canal locks.

transportation of machine guns throughout the army. Each of these machine gun companies consists of three officers, sixty-eight men, six transporting carriages drawn by dogs, and twelve ammunition carts, also drawn by dogs. It was intended eventually to supply each company with forty dogs, which were to be bred and trained at the main dog station at Beverloo. Hence, each company has four dogs in reserve, when its eighteen small carts are harnessed." This idea of



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A Belgian dog-drawn machine gun.