AUTO CHAIRS FOR THE ST. LOUIS FAIR.

Automobile chairs propelled by electricity will be used at the World's Fair at St. Louis next year. A concession was recently granted by the Exposition to a St. Louis company, giving them the right to operate the new style chairs within the World's Fair grounds. The chair is the invention of Semple S. Scott and is the result of nearly three years' experimenting and designing.

It is said that the machine has a uniform speed of three miles an hour, which is exactly the same running up or down a steep grade or on a level. The occupant has no control over this speed whatever. The simplicity of operation is such that anyone can readily run it. The most desirable feature is the fact that the machine is provided with a sensitive guard rail. The latter is deemed the most valuable invention on the machine. If the machine collides with any object or person, a pressure of only a few ounces pushes this guard rail back and causes the wheels to become locked, thus bringing the chair to a dead stand-still before the machine itself strikes the object or person.

Each chair will carry two passengers, one of whom may operate the machine, or, if desired, an operator will be furnished, who will not only run the machine but will also serve as a guide to explain all the points of interest. The operator sits on a detachable seat at the rear of the chair, from which point he controls the machine, the controller and steering bar being removed from the front and attached to sockets in the rear.

AUTO CHAIRS FOR THE ST. LOUIS FAIR.

Mocha Coffee.

During the past few years I have often heard the assertion made and have seen it in the newspapers in our country that there was no such article as Mocha coffee, that the term is purely a fiction, and that what was once known as Mocha coffee is so mixed with other coffees that there is no real Mocha.

In order to help correct such an impression and to do the coffee merchants of this place and the importers of our country an act of justice, I wish to say that there is such an article to-day in the American market as Mocha coffee, that this coffee is of the same kind and from the same place as the noted Mocha coffee of several generations ago, and that the growers and handlers of this coffee are as particular in regard to its quality and purity as they ever were.

At different times merchants have tried to ship coffee from other countries to this place and forward it from here as genuine Mocha, but the city authorities have always suppressed such traffic and have otherwise assisted the merchants in keeping up the standard and good name of this coffee.

Knowing of the carefulness with which the coffee interest is managed and the government's protection over it, I am of the opinion that if by the time the consumer gets his Mocha coffee it is not pure, the mixing has been done after it leaves Aden. —W. M. Masterson, U. S. Consul at Aden.

Mr. Edison's dry gold separating process is to be used in Australia. Mr. Cloyd M. Chapman, a mining engineer, has had a separator built and shipped to Australia.

IMPROVEMENTS IN STEAM SHOVELS.

BY WALDON FAWCETT.

A most notable advance has been made within the past few years in steam-shovel construction—progress impelled in part by the greater exactions made upon these mechanical excavators by modern construction work. The 35 and 45-ton shovels were considered, until a comparatively short time since, amply sufficient for almost all kinds of excavations; but at present the 55-ton shovel is accounted the standard machine; and 65-ton, 75-ton, and 85-ton are coming into use to an increasing extent, while even the 95-ton giants are proving that they are not only useful but also economical for certain classes of work.

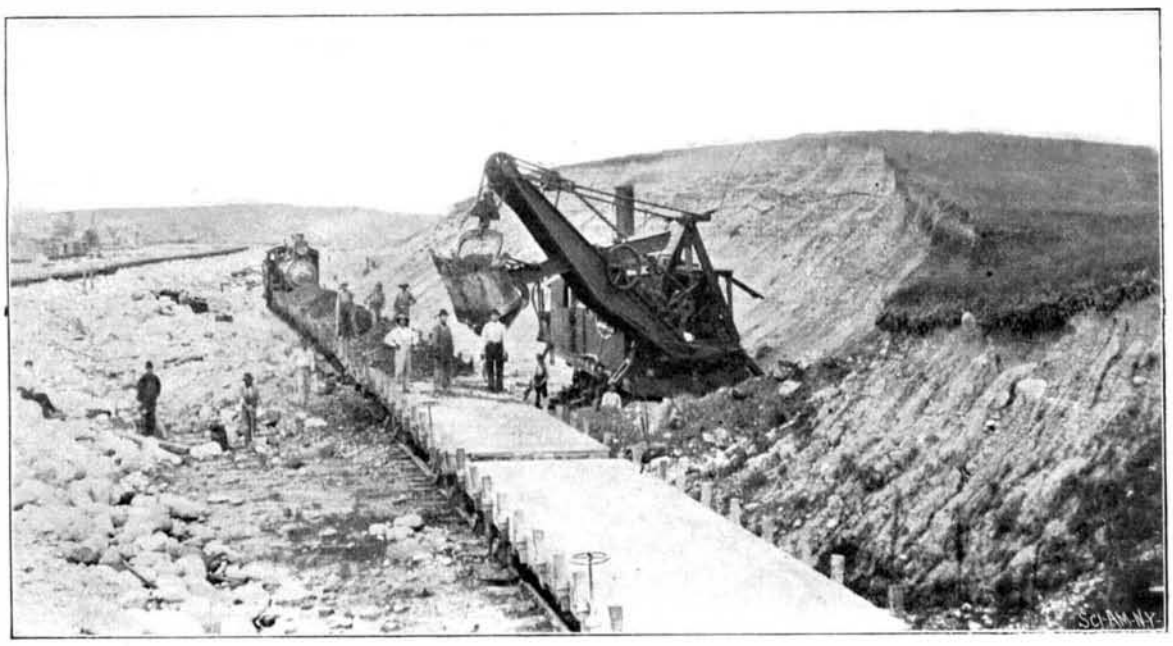
The true meaning of the increase in the capacities of steam shovels is best indicated by comparative statistics. Thus, while the clear lift from rail to bottom of dipper-door when open is but 10 feet in the case of the 35-ton shovel, it is 12 feet in the 55-ton shovel; 15 feet in the 65-ton machine; 17 feet in the 75-ton shovel; and 18 feet in the 85-ton apparatus. The width of the cut which, in the old-style, lighter-weight shovels, rarely exceeded 48 feet at 8-foot elevation, ranges from 50 to 54 feet in the case of the newer models. The steel car of 29½ feet in length, which serves as a foundation for the 35-ton shovel, appears rather insignificant beside the cars of 41 feet 7 inches, which bear the latest specimens of steam shovel construction.

The same proportionate advance is manifest in the case of the main engines, which have grown from the 8 x 10-inch size in the 35-ton shovel, to the 14 x 16-inch engines of the present day 95-ton shovel. Likewise the steam generators have shared in the new order of things, as will be appreciated by a comparison of the 48-inch diameter boiler of the 35-ton shovel, with the 66-inch diameter boiler which supplies steam to the machinery of the 95-ton shovel.

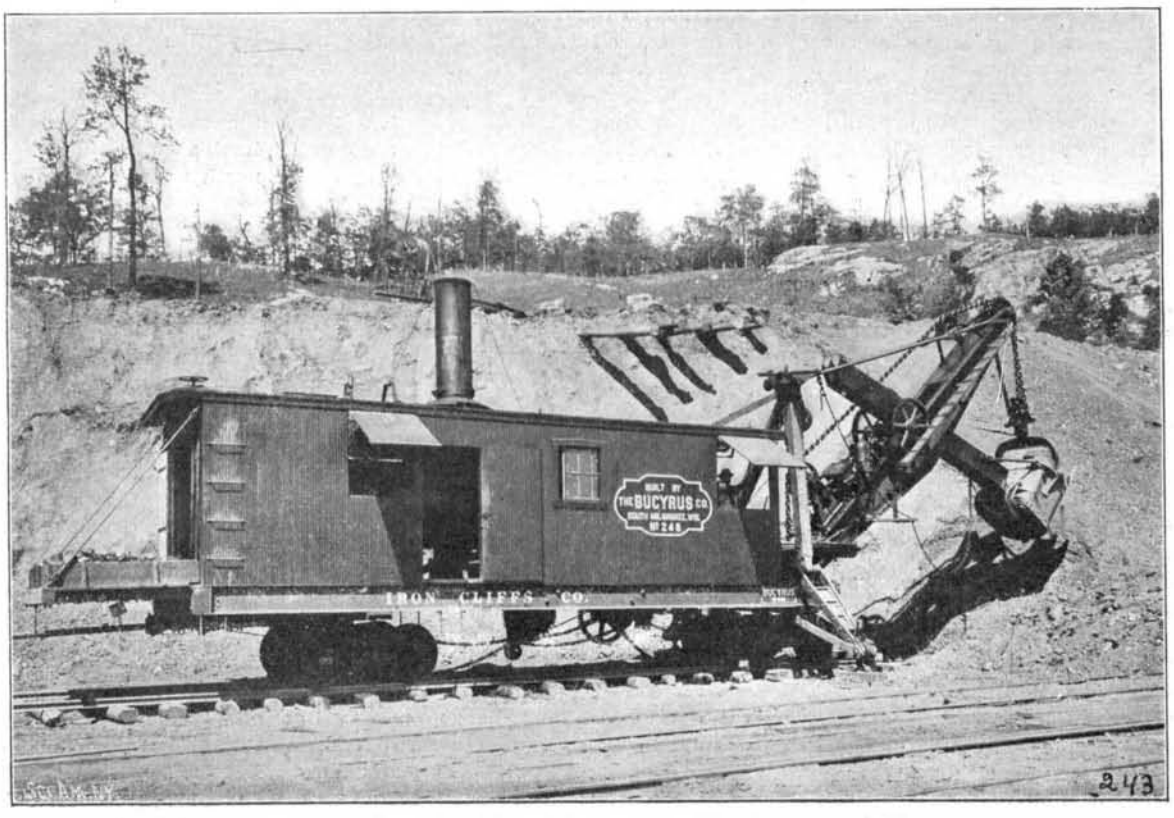
After all, however, the most significant phase of the development of the steam shovel is found in the enlargement of the capacity of the dipper, or, in other words, the increase in the actual working capacity, as indicated by the task accomplished. The capacities of the dippers of various representative shovels are as follows: 35-ton, 1½ cubic yards; 45-ton, 2 cubic yards; 55-ton, 2½ cubic yards; 65-ton, 3 cubic yards; 75-ton, 3½ cubic yards; 85-ton, 4 cubic yards; 95-ton, 5 cubic yards. Still other radical improvements might be noted, each important in its way. For instance, the type of thrust motion, which was the frictional in the old-style shovels, has been changed so that independent reversible engines are now employed; and instead of the vertical, submerged-flue type of boiler in the old machines, the newer products of the shovel builders are equipped with locomotive boilers.

Some recent achievements constitute a revelation of the possibilities of the new types of shovels. On the Great Northern Railroad, recently, a 65-ton shovel took out 4,300 cubic yards of sand in a single day, and, during an interval of several months, took out an average of 2,291 yards per day. At Ishpeming, Mich., last season, a 65-ton shovel handled 120,000 tons of iron ore with practically no breakage or delay for repairs. A still more striking example of the endurance of the modern steam shovel is afforded by two 60-ton machines at the Lake Superior Consolidated Iron Mines, which handled without a break 304,326 tons of iron ore, 135,048 cubic yards of gravel, and 76,177 cubic yards of dirt from railroad cuts.

A standard medium-size shovel, in use on railroad



A Sixty-Five Ton Shovel Engaged in Railroad Work.



Loading Ore from a Stock-Pile with a Sixty-Five Ton Shovel.

IMPROVEMENTS IN STEAM SHOVELS.

work in the West, lately made a record of 1,330 cubic yards per day for twenty-seven months, a large portion of the material handled being rock. As affording an interesting criterion of the cost of operation of a steam shovel under modern conditions, it might be cited that there is at a mine stock pile at Ironwood, Mich., a shovel which has been in practically continuous operation for five years past and has, during that period, loaded a total of 430,036 tons of iron ore at a cost of 2.53 cents per ton, which includes a charge of 0.31 cent per ton for repairs.

Railroad construction work has, from the outset, constituted one of the most important avenues of usefulness for the steam shovel; but the past year or two have afforded revelations of the capabilities of the machines in this line of work. Special opportunities were offered for steam shovels in the case of the improvements recently undertaken on the Union Pacific Railway, in eastern Wyoming, from the fact that the work was remarkable for the large amount of material required in the construction of embankments and in building the Sherman Hill and other tunnels. The famous Dale Creek fill, near Tie Siding, Wyo., is 120 feet in height and 900 feet in length, and the 500,000 cubic yards of material used in its construction were excavated by two steam shovels. This fill, with two adjacent embankments, required 750,000 cubic yards of filling within the distance of one mile. In the construction of the famous Sherman Hill Tunnel, there were employed three steam shovels, which were especially built for the purpose. The tunnel is 17 feet in width, and this made it necessary to equip the shovels with short booms. Compressed air was employed for the operation of the machines. Prior to the commencement of work upon the Sherman Hill Tunnel, 300 feet per month constituted the best record for steam shoveling under similar conditions; but in the case of this Wyoming contract, as high as 500 feet were excavated in a month.

Not less interesting than the improvements that have been made in the shovels themselves, are the new fields of activity which have been opened to these powerful mechanical workers. One of these is found in gold placer mining, in which there has lately been a considerable revival of interest. The steam shovel is adapted for dry-land mining, or where but little water is found; and where the gold-bearing material is covered with an overburden of barren gravel or earth, the steam shovel is especially suited, as the stripping can be disposed of readily.

A valuable adaptation of the steam shovel is found in the sewer excavating machine, which has lately been introduced. This machine consists practically of one of the moderate-sized steam shovels—say the 45-ton type—mounted upon heavy cross-beams and rollers and fitted with a long handle and special dipper. Such a machine is capable of digging a trench up to 12 feet in width and 20 feet deep. It carries a dipper of special construction, in which the cutting edge is the widest part, so that the lugs and fastening for the bail are clear.

In view of the probable extensive employment of steam shovels in the completion of the Panama Canal under the jurisdiction of the United States government, it is interesting to note the previous accomplishments of these shovels in canal excavation. In the recent deepening and enlargement of the Soulanges Canal, the most important link in the system of artificial waterways along the St. Lawrence River, steam shovels were extensively employed; and a single machine excavated 600,000 cubic yards of blue clay and 30,000 cubic yards of hard pan and bowlders of the very worst and hardest material. This latter, it may be remarked, was excavated without the use of dynamite. Two steam shovels met unusual exactions in the construction of the Massena Canal, at Massena, N. Y.; and the record of these great mechanical shovelers in the construction of the Chicago Drainage Canal is well known. Sixty-five-ton shovels were employed principally in excavating for the Chicago waterway, and, considering the enormous quantities of rock and other difficult materials handled, the break-downs were surprisingly few in number.

Chains constitute one of the most important component parts of a steam shovel; and, in order to secure increased efficiency in this class of material, steam-shovel manufacturers are now establishing their own chain factories, where hand-made chains, varying in size from ½ to 2 inches, are turned out. Last year a single shovel manufactory produced, for use on its own machines, 22,500 tons of chain, all made from a special grade of iron. Every bar of this iron is subjected to a most severe test, for the demands upon the chains in use on steam shovels are so severe that the metal employed in ordinary chains will not withstand the strain. The test to which the chain material is subjected consists of placing the end of a bar under a trip hammer, bending it over cold, and hammering it down solid with the bar. If a check or a flaw is shown, the bar is discarded.

On the 95-ton shovel here shown, 1½-inch hoisting chain is employed. A pull on the dipper of 116,000 pounds is obtained with a working steam pressure of 100 pounds to the square inch.

There are three independent reversible engines—one for hoisting the dipper, one for swinging the boom, and one for thrusting the dipper into the cut. The first two are located on the car and the third is located near the lower end of the boom.

The main engines gear directly to a large gear on the shaft of the hoisting drum. The sprocket chains shown beneath the car, which are used for moving it ahead, are both driven by the shaft located under the middle of the car. This shaft is driven by gearing from the hoisting shaft.

The swinging engines are geared through an intermediate speed reduction shaft to the large swinging gear which is bolted to the swinging drum. From the swinging drum the wire ropes lead around the swinging circle in opposite directions. The engines and large gear-wheel of the swinging drum can be seen through the open panel of the side of the car.

The boom engines gear directly to the two large gears mounted on a short transverse shaft on the boom. Near the middle point of this shaft are located two pinions which gear with the two racks on the dipper arm. When the engine is in motion, the dipper arm is forced out or in, depending upon the direction of rotation of the engines. The boom is not raised or lowered while in operation, but can be swung through an angle of about 180 degrees about a vertical axis.

A great deal of the railroad work being done throughout the country in the way of improving existing lines consists of double-tracking former single-track lines.

The cheapest way of doing this work is to use a steam shovel working parallel to the existing track and at such a distance from the track that it can load the material excavated upon cars placed on the track. In one cut, the shovel can prepare the ground for the laying of ties and rails for the new track. The only difficulty in this manner of working is that delays are likely to occur to traffic, owing to the presence of the gravel train on the main line.

The solution of the problem was the design of the 95-ton shovel, capable of handling a dipper with a capacity of 5 cubic yards, and working as fast as any shovel of smaller size can work. This shovel can dig at the rate of four shovelfuls per minute in the material usually encountered. The customary size of dipper now in use has a capacity of 2½ cubic yards—one-half that of the 95-ton shovel. By using the large shovel the gravel train is loaded and able to move out of the way of fast trains in just half the time required with the usual size of steam shovel. These large shovels are also suitable for excavating iron ore from open mines, in which case they are equipped with a dipper sometimes as small as a yard and a half.

Fig. 1.—Mars on May 29, 1890.

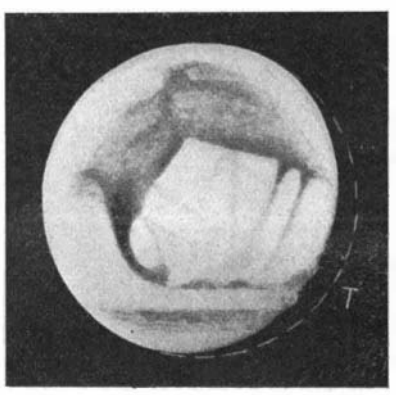


Fig. 2.—Mars on July 6, 1890, Showing Protuberances.

PHOTOGRAPHS OF MARS TAKEN WITH LICK 36-INCH TELESCOPE.

Wood Silk.

News comes from abroad that an Englishman has patented a method of making imitation silk from wood. A plant erected near Sydowsaue, Germany, is at present turning out 50 pounds of skein silk a day, which product can be increased in quantity to 2,000 pounds. The silk is soft in texture, and cream in color. Each thread is made up of eighteen single strands; a single strand is hardly perceptible to the naked eye. In strength, the real silk is two-thirds stronger than the imitation. When woven into pieces, the new substitute is said to have the appearance of real silk. How this new article will compare with the genuine, in the matter of wear and price, it is impossible at present to state. The manufacturing process is likewise undiscoverable. It is asserted, however, that the pulp undergoes a chemical process and is pressed through very fine tubes, by hydraulic pressure, forming the single strands which go to make up the thread.

THE PROJECTIONS OF THE PLANET MARS.

Every two years, when the planet Mars comes into favorable position for observation from the earth, astronomers are able to see, now and then, one or more irregular projections on the sunrise or sunset line. One of these was observed recently at the Flagstaff Observatory, and reported in the newspapers.

The nature of these projections is pretty well understood by astronomers, but the biennial press reports of such observations give rise to a question on the part of the public as to whether they could be signals from intelligent beings on that planet.

These bright projections were unknown up to 1890, when the first ones were observed with the great Lick telescope, this instrument having been mounted too late in the year 1888 to permit observations of this kind being made at that time. The 1890 observations are well illustrated in the accompanying drawing, *B*, which has thus far been published only in technical journals. Fig. 1 represents the planet Mars as circular in form, at about the time when the sun, the earth, and the planet were approximately in the same straight line. When Fig. 2 was made, the relative positions of these objects had changed, and Mars no longer appeared as a complete circle; it had the gibbous form of our moon when ten or eleven days old. Only that hemisphere of Mars upon which the sun is shining is bright; and as a portion of the dark hemisphere was turned toward the earth on July 6, a considerable crescent on the side marked *T* was invisible. The edge of the planet bordering the invisible crescent is known as the "terminator," and in this case it was the line of sunrise. It is always upon the terminator that the projections referred to are seen. A glance at the drawing will show the appearance and positions of the two that were first observed by astronomers.

Those who have critically observed the terminator of the moon when ten or eleven days old will have no difficulty in detecting, even by naked eye, similar bright projections on that body. There is no question as to their nature. Mountain peaks of considerable elevation catch the first rays of the rising sun or the last rays of the setting sun, the lower levels at that time being below the line of the rays, and therefore absolutely invisible. Looking at the moon's sunrise line from our point of vantage, these illuminated elevations will therefore appear as bright projections extending from the terminator a short distance into the dark sky.

The bright projections on the terminator of Mars have a similar origin, though, instead of being elevated land areas, it is reasonably certain that they are clouds in the thin atmosphere of the planet. If they were mountains they would be seen again and again, not only from night to night, but at each returning opposition, and in exactly the same places. This is not at all the case. They are occasionally observed in substantially the same position on two, three, or four successive nights; but never, I believe, for a longer period than this, and their forms change from day to day. They are not fixed features of the planet's surface. In this connection, however, it should be said that a mountain twelve or fifteen thousand feet high should probably form a fairly conspicuous projection on the terminator when the planet is in the most favorable position.

All the observed phenomena can be satisfactorily accounted for on the theory that the projections are due to clouds of considerable size, at great elevations in the rarefied atmosphere. Such clouds would be illuminated by the sun's rays while the land areas beneath them were still so dark as to form in effect a black background, and the contrast between them and the planet's surface would be very great.

The comparatively small number of these projections is strong evidence that the atmosphere of Mars is remarkably clear as compared with that of the earth. This is in complete harmony with our knowledge derived from spectroscopic observations, that the atmosphere of the planet is very rarefied—its density at Mars' surface probably being much lower than that of our atmosphere at the summit of Mount Everest. The scarcity of clouds is still further demonstrated by the practically uninterrupted view which astronomers are able to obtain of the planet's principal surface features.

W. W. Campbell, Director.

Lick Observatory.

It will be remembered that in our last issue we mentioned the fact that the Governor of the State of Texas had offered a prize of $50,000 for the best method of eradicating the cotton-boll pest. The first claimant of the prize is George Franklin, a farmer living near San Marcos, Texas. He has submitted his claim to Gov. Lanham. His remedy will be passed upon by a committee of five farmers whom the Governor will appoint for the purpose.