iron lands in Colorado, Wyoming, New Mexico, and Utah; some 600 square miles of the finest coal—anthracite as well as coking and non-coking bituminous—one tract being 250,000 acres in extent, all easily accessible from the steel plant; limestone quarries, manganese mines, etc. It has 39 coal mines and 3,500 coke ovens—a majority of them being of the "beehive" type, for there is no market for by-products sufficient to warrant the use of by-product ovens, which are comparatively very expensive, and against which there is prejudice because of the contention of some experts that the quality of coke produced from western coal in by-product ovens is inferior. Including those not yet thoroughly opened, the Colorado Fuel and Iron Company has in various parts of Colorado, Utah, New Mexico, and Wyoming, 65 properties scattered over an area of 260,000 square miles.

Fundamental differences exist between the problems of development in the Rocky Mountain region and those confronting iron and fuel corporations in the middle West. In the latter region, when development of the coal and iron resources was begun on a large scale, means of transportation were to a great extent already provided, or by the construction of short spurs of railroad and the utilization of natural waterways, raw materials could be transported to the steel works and the market at comparatively small cost and without great preliminary expenditure. Again, in the comparatively thickly-populated middle West, the securing of labor near at hand is possible and, to a great extent, places for workmen to live are already provided near the seats of industry. In the Rocky Mountain region, the pioneers of the iron and fuel industry found no such ready-made conditions. In the field which the Colorado Fuel and Iron Company operates there are no navigable lakes or rivers. To reach new properties railroads had to be induced to extend or the company had to build its own lines. It now operates 178 miles of railroad, and has supplemented existing lines of electric communication by 1,835 miles of telegraph. In fact, in a majority of cases, where the "prospects" have been in the midst of the desert or far off in "the hills," the company has had, in addition to the task of opening mines and providing means of transportation, those of building towns, of providing people to live in them, and of supplying water, food, and merchandise. In short, besides the ordinary problems of coal and iron mining, coke and steel making, the Colorado Fuel and Iron Company has had to solve those of general development.

Some 17,000 men, representing between twenty and thirty nationalities, are now employed by this corporation. Between 4,000 and 5,000 are employed at the steel plant.

The Colorado Fuel and Iron Company's principal source of iron ore is the Sunrise group of mines in Laramie County, southern Wyoming, 360 miles from the steel plant on the Colorado & Southern and the Burlington and Missouri River railways. The open-cut system of mining with steam shovels, which was the principal method employed earlier in the history of this property, is now largely replaced by the "milling" system of underground mining, the product being handled through shafts and tunnels. There are also smaller iron mines at Orient, Colorado, and Fierro, N. M. In the open-cut work the ore is loaded directly from the steam shovel into standard-gage railroad cars. In the underground work the ore is dumped from skips and mine cars into bins, from which it is drawn off into the automatic dump cars, in which it is carried to the steel works and dropped into the ore bins at the furnaces.

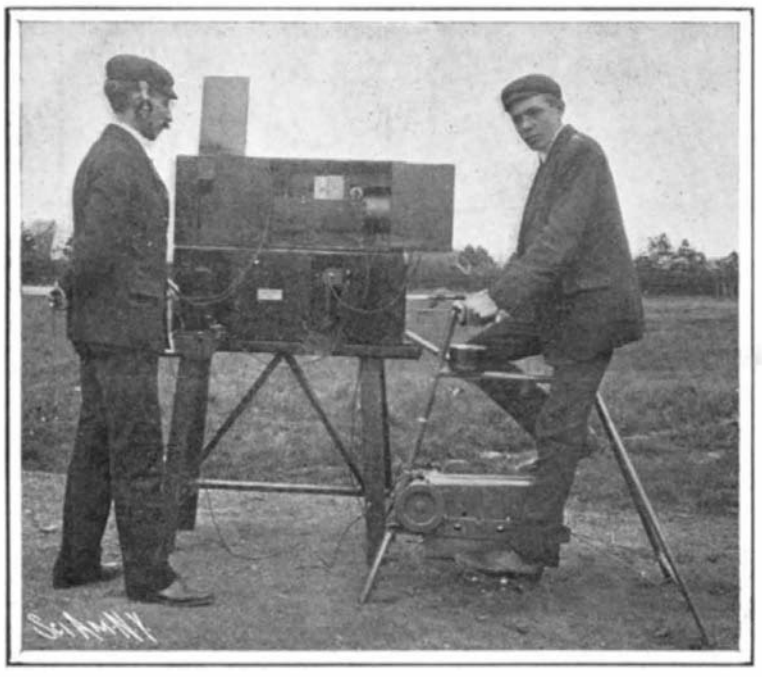
On a track beneath these bins run electric trolley "scale cars," into which are drawn from the bins, in proper proportions by weight, the coke, limestone, and ore to make up the "charge" for the blast furnaces. The contents of the scale cars are in turn automatically dumped into the "skip cars," which run up a "bridge" on the side of each blast furnace, and automatically drop their contents into the "upper bell"—a cone-shaped receptacle at the top of the blast furnace. Then this upper bell is lowered, allowing the charge to drop upon the lower bell, whereupon the upper bell is again raised. Next the lower bell is lowered, and the charge drops into the fiery interior of the furnace. The slag and molten iron are drawn off into immense pot cars.

The slag is hauled over a short railroad to one of the reservoirs three miles south of the plant, where it is dumped while still molten upon the sides and bottom. By this ingenious arrangement the problem of slag disposition is solved, and the seepage from the reservoirs reduced.

The molten iron is hauled either to the pig-casting machines or to the metal storage reservoirs at the open-hearth and Bessemer steel departments where it is kept in a molten state and drawn off as required in the furnaces or the "converter." After the impurities in the form of silicon, carbon, manganese, sulphur, and phosphorus have been to a greater or lesser extent eliminated by these processes, the molten steel is drawn off and cast into ingots. After these are stripped from their molds they are taken either to the 40-inch blooming mill, where they are reduced to 4-inch billets and then worked into the other highly differential products, or else are taken to the rail mill and rolled into railroad rails. Although at the Minnequa Works the Bessemer process will always be a very important feature, it is likely, owing to the chemical constituents in the ore found in the new deposits of the company now being opened, that the open-hearth process will become more and more important.

Throughout all processes of mining and steel making the company uses the most improved labor-saving machinery. Indeed, from the time the ore lies in the earth until it is put into its final form as finished iron or steel, it is in many cases not handled over once or twice by manual labor, but altogether by automatic machinery.

That the Colorado Fuel and Iron Company is one of the few steel companies not a constituent part of the United States Steel Corporation, and that it operates the only large steel plant west of the Chicago district, are features that have important bearings upon the company's place in the iron trade. It is, moreover, absolutely independent of competitors, in that it owns sources for all its raw materials. In the days of the "old" management, the company suffered much from unfavorable freight rates and discriminations, and made several appeals to the Interstate Commerce Commission with more or, usually, less success. Arrangements undoubtedly will be made eventually to send Colorado steel products by way of the Gould system to San Francisco, and from thence by sea to the Orient, and by the direct railroad route to Galveston, and thence by water to all South American points. With the completion of the Panama Canal this natural advantage will be increased, for then this Colorado steel company will have two tidewater outlets to the Orient—south and west.



LODGE-MUIRHEAD PORTABLE WIRELESS TELEGRAPH PLANT FOR MILITARY USE. THE CURRENT IS GENERATED BY A SMALL CONTINUOUS-CURRENT MOTOR DRIVEN FROM A STATIONARY BICYCLE.

The Department of Anthropology of the University of California has just been enriched by the acquisition of the first skeletons of Pomo Indians possessed by any museum or institution. An expedition sent by the department to Mendocino County, California, has returned with five complete skeletons, several parts of skeletons, many beads and other objects buried with the dead. These will be of great value in determining the qualities and characteristics of the Pomos and their relationships with other tribes of California Indians.

The Pomos practised cremation, which explains the almost complete lack of remains of them. They were of middle height, with round, heavy skulls. Many living Pomos are to be measured and photographed for purposes of comparison with the skeletons, the bones of which are now being measured. When comparisons have been made with the remains of other Indian tribes, the results will be published by the University of California. It is expected that our knowledge of the origin, connections, and wanderings of the Indian tribes will be considerably increased by this determination of their characteristics, and that much information that is not supplied by a study of their language and customs will be obtained.

THE LODGE-MUIRHEAD PORTABLE WIRELESS TELEGRAPH PLANT FOR MILITARY PURPOSES.

An interesting and compact wireless telegraphic plant of the portable type has been constructed by Sir Oliver Lodge and Dr. Alexander Muirhead, the system employed being that evolved jointly by them. The installation, which is self-contained, is especially intended for military operations, and for facilitating transport particularly over difficult country it has been made as compact and light as possible, so that it can be easily stowed away for carriage by mule. It is of sufficient capacity to enable communication to be established over distances up to 50 miles across land, or 150 miles over sea.

The antennæ are carried by bamboo poles, of short, convenient lengths for transport, which poles, when fitted together, form a somewhat cubical structure 40 feet in height. No earth capacity is necessitated and indeed any such connection must be avoided when it is desired to insure the greatest degree of efficiency over long distances.

The transmitting and receiving installations are carried in a small cabinet and occupy the minimum of space. When in use this cabinet is supported upon a folding trestle. The necessary current is generated by means of a small continuous-current dynamo carried in a frame resembling that of a bicycle, the power being supplied by bicycle pedal action, as shown in the accompanying illustration, with the electric valve system devised by Sir Oliver Lodge to accumulate the impulses. For receiving messages the Lodge vibrating needlepoint-oil-mercury coherer with telephone receiver is fitted.

Decrease in Use of Lightning Conductors.

It seems probable that there has been a decided falling off in the use of lightning conductors within the last thirty years. According to the United States census statistics, there were, in 1860, twenty establishments manufacturing lightning rods, which turned out a product valued at $182,750. In 1870 the number of establishments had risen to twenty-five and the value of the products to $1,374,631. In the next decade the number of establishments fell to twenty and the value of the product to $801,192, and finally in 1890 the number of establishments rose to twenty-two, but the value of the product diminished to $483,296. At the census of 1900 the classification in vogue from 1860 to 1890 was abandoned and lightning rods were tabulated in the general classification "Foundry and Machine Shop Products." There are no means of determining absolutely whether the large decrease in the value of the manufactured product from 1870 to 1890 marks a decline in the use of lightning conductors; certain it is, however, that the "lightning rod man" is not so much in evidence as he was in the early seventies.

In large cities the use of lightning rods is not imperative owing to the prevalence of modern steel structures and in general buildings with metal roofs. For buildings that stand isolated in the open country the prudent course would be to install thereon a system of protection from lightning. The extent to which the building should be protected and naturally the expense of installation should bear some definite relation to the value of the building. If the building is insured against loss by fire or lightning, it would not seem advisable to go to the additional expense of erecting lightning rods. In any event the final decision must be reached by the owner of the building. In arriving at his decision he should be guided by the fact that, while absolute security from damage by lightning is attainable only with great difficulty and considerable expense, a reasonable degree of protection can be secured by very simple means, provided the system of protection be devised and erected by a thoroughly competent person.—From a bulletin issued by the U. S. Weather Bureau.

Santos-Dumont's Flight.

Santos-Dumont recently succeeded in driving the "Bird of Prey" many yards into the air, and eleven yards through it. He then came to earth, smashing his propeller wheels and frame. There seems to be no doubt that he actually flew. Fortunately, M. Santos-Dumont was unhurt.

Although the Hall American patent for the manufacture of aluminium has expired, the Bradley patent is still in force, and will not expire until 1909. The Bradley patent is of fundamental importance for the manufacture of aluminium, covering, as it does, the use of the current, as well for the purpose of keeping the electrolytic bath in a molten condition as for effecting its decomposition and setting the aluminium free at the cathode.