

Passing of Steam Power

In America, for at least twenty years, the American has been pleased to speak of his present as the "Age of Electricity." Today in Chicago, one of its greatest public calamities is the smoke nuisance. At the same time the city's manufacturers and power-using concerns are employing electricity until shafts, pulleys and beltings are almost forgotten paraphernalia of the workshop. And yet—

Look at the smoke. According to Professor Philip B. Woodworth of the department of electricity in Lewis institute, the fact that so great a proportion of Chicago's power is electricity is incompatible with the blanket of smoke which wraps the city in its folds year in and year out.

"London may talk of precipitating its fogs and smoke by discharging electricity in the clouds," said he, "whereas the feasible plan would be to make such smoke as was unavoidable far outside of London and conduct the refined light, heat and power into the city limits, distributing it without loss and without contaminating the atmosphere."

Professor Woodworth makes the point, with reference to Chicago, that with perfect methods for insulating wires and a system by which electricity at 40,000 volts may be sent safely for any distance with only trifling loss, the city need have no smoke. Central generating stations might be established far out of the city, perhaps in the center of some coal field where the electrical energy would be created at a small part of the cost that now obtains in even the big power plants in Chicago. It would be cheaper to transport electricity than to ship coal to the myriad steam producing plants, and all the disadvantages and costs that attend the combustion of coal in furnaces would be avoided.

The small steam engine has been weighed in the balance and found wanting. In half a dozen ways it has fallen from its pedestal, never to be reinstated.

In the beginning of things the small steam engine, generating ten-horse power or less, got only about 35 per cent of the energy out of coal. And it requires almost as much power to run it as would a steam plant generating 1,000 horse-power. An engineer who shoveled coal by hand, raked his own ashes, and kept an eye on the pumps of the small engine, with almost less labor could manage the automatic feeding device of the giant steam plant which could get 80 per cent more efficiency out of coal. In the small furnace it was necessary to make one horse-power of steam energy for one hour, while in the big plants three pounds of coal were sufficient for the same work.

According to this showing, the small steam engine, supplying power to a manufacturing establishment, does so at a cost for fuel of more than three times that of a big plant, while the engineering cost, in proportion to steam developed, is much more.

Then, considering the steam engine with regard to rents, it has proved to be costly. Not only must space be provided for engine and boiler, but fuel must be housed and an elaborate system of belts and shafts must be instituted. The whole plant carries with it the necessity of dirt, grease, heat, smoke and noise.

To this must be added the first cost of the plant. A steam engine generating ten horse-power, will cost nearly twice as much as a ten horse-power dynamo; it will take up ten times the room and it will not last so long. It will take more labor to run it, all considered, and all the disagreeable features attendant upon burning coal will be present.

Just what are these disagreeable conditions are not realized by the public at large. Sometimes a man passing a basement window and catching the hot, foetid blast from a fan driving heat from a basement boiler-room will gasp in the already hot street and hurry on beyond reach of the fan's currents. But this is only an indication of the conditions below.

The hold of a steamship, in which giant boilers are fed by gasping stokers, has been lived to the shoe of orthodox scriptures. But there are boiler-rooms in down-town Chicago that are as close, dark and oppressive as ever the hold of a steamship was. Many of them are without the up-to-date appliances of the big steamship's boiler-rooms, and men work harder in the immense heat than they are forced to do on the Atlantic liner.

One down-town building, especially, has the reputation of being a baker of men. It manufactures its own electricity for running elevators, supplying lights, for cold storage, and for ventilation. It has a

big battery of boilers which are half under the pavement, and here, summer and winter, firemen and engineers work, stripped to the waist, in a heat that would prostrate one not used to it. It is said in truth, that on the steel floors of this furnace room, at any hour of the day, an egg will fry hard in ten minutes six feet from a furnace mouth.

From this basement, too, a continual stream of hot, vitiated air is thrown into one of the main downtown streets, not infrequently the chimney that furnishes draft to the furnaces is pouring clouds of smoke into the upper air, and at all times street and alley traffic is more or less impeded by the coal wagons which cart fuel to the fiery mouths of the furnaces. Coal holes are opened, down which fuel is shoveled and out of which refuse ashes are thrown, each making its share of the omnipresent dirt and grime of downtown.

And yet it has been proved that from a great central plant for the manufacture of electricity the fluid can be delivered at a switchboard, ready to be wired to the user, for less than one cent an hour for each horse-power. And from the time this energy is sent from the great central dynamo, miles away, the loss of power will be only 10 per cent.

This has been made possible by conserving influences and forces in the manufacture of electricity. Today the cost of sending electricity from a central point to a point of distribution virtually is only the cost of the copper.

When the Edison machine first was built it would convey electricity at only 100 volts. Then it was found that with this voltage and the inferior manner of insulating wires the work limit was less than 2,000 feet.

Today insulation is practically perfect, and wires are made capable of carrying electricity at 40,000 volts with almost impalpable loss of the vital fluid. A comparison of cost of plants under the new and old voltage shows just how the cheapening of electricity and the spread of it as a motive power have come about.

When Edison's first machine was built, carrying only 100 volts, the copper wiring necessary to carry one horse-power twenty miles, with a loss of twenty per cent, energy, would have been \$83,300. Today the same horse-power, coming from a plant which has 40,000 voltage, means a wire expenditure of \$1.04 and a loss of less than 10 per cent.

This tremendous saving has been in the enormously increased voltage or pressure. This voltage means no limit to the distance to which electricity may be transmitted.

Every day in Chicago the electrical supply companies are encroaching upon the field of the obsolete steam engine. Ten thousand steam horse-power are displaced every month by these companies, and scores of other steam plants that are driving belts and shaftings are turned to the development of electricity. There is scarcely a building in down-town Chicago that has not been given over to electricity. It may be using its old hydraulic elevators, but electricity is running its pumps. Its own lights are manufactured in the plant, electric fans are run from the same force in summer, and in some of these buildings heaters are used. In most of them electricity heats the supply tanks for hot water.

At the same time this electricity commodity has its inefficiencies. As a light producer it is comparatively expensive, for the reason that a sixteen-candle power lamp of the incandescent pattern gives 10 per cent. light and 90 per cent. heat, while the arc lamp gives only 5 per cent. light and 95 per cent. heat. Compared to these gas will give 4 per cent. light and oil only slightly less.

It is as a heater—and consequently as a power producer—that electricity is supreme. An electric heater utilizes full 95 per cent of the current that reaches it. As a domestic utensil, the electric stove is one of the simplest contrivances in a household. In preparing the hot surface, it is turned upside down and coated with porcelain. On this coating an iron wire is laid and looped back and forth over the porcelain surface at a short distance apart, after which a second layer of porcelain is laid over the wire and burnt into and over it, leaving the wire embedded in porcelain and close up against the heating surface. It is ready then for the current.

Electricity as a commodity is measured by the Watt hour. Watt would not have known a spark of electricity from a fire-fly in the dark of the moon, but he got his name in the meter in some way. The Watt hour represents 2,655 foot-pounds and it takes 778 foot-pounds to raise one pound of water in temperature one degree Fahrenheit. Fifty Watt

hours of electricity are required to light an incandescent lamp of 16-candle power.

When this commercial energy has been developed and transmitted to a building it becomes almost anything that the purchaser desires to make of it.

In the heat of summer this energy will make ice in the basement quite as readily as it will warm a room in winter. It will light a room or turn a cooling fan. It will turn a lathe or send a carrier rumbling across the floor to an elevator and lift its burden to any height. It becomes the universal good genius—the literal fulfillment of the prophecy that might be found in Aladdin's lamp.

With all that has been done with this strange element in Chicago it is the opinion of Professor Woodworth that it is only the beginning. There has been too much waste of fuel and too much smoke and grime attendant upon its production.

"The time is coming," he says, "when great central stations will supply this energy to Chicago. It can be supplied so much cheaper in this way that the small generating plant soon will have had its day. It will be discovered that the smoke nuisance, too, will prescribe for itself when the time has come."

"In such great central plants with the cheapening methods for conducting electricity, it will be desirable for them to get away from the city in the direction of the coal supply. This at least removes the smoke and soot nuisance from the city horizon. But in such plants as these would need to be mechanical means to secure perfect combustion in the boilers would do away with smoke and soot anyhow."

"These plants would be so far away from the city limits that ground rents and values would be of comparatively small concern. The transportation and handling of fuel would be minimized, and apparatus for burning the cheapest grades of coal could be instituted. All these would tend to lessen the cost of the commodity to both manufacturer and consumer."

"When Chicago finally has gone over to electricity as the one motive power, that energy will be developed from cheap coal, burned in the central plants to the best advantage possible. It is drifting toward electricity rapidly. It would be surprising to know just how many steam plants are superseded in Chicago every day."

"So far as I know the town of Jackson, Mich., has advanced farther in electricity than any other city in the United States. Virtually everything there is run by electricity. It is close to extensive coal beds, and a few years ago several brothers organized to manufacture electricity for commercial purposes. The plant grew and enlarged, more territory was taken in, until nearly every contiguous town is drawing much of its light and power from the Jackson plant. Jackson has given an object lesson and the world will profit by it."

Already the country at large has been affected deeply by electricity. In many farming sections are young men who know all about the construction of a dynamo. They may ride from their farms to town in an electric trolley car, and the electric telephone is in nearly every house.

One many find country villages with 1,000 population where the streets are lighted with arc or incandescent lamps; where the local weekly paper is printed by electric power, and where, in the livery and feed stable, a horseman "clips" a horse with a pair of electric clippers. Houses are lighted by electricity at a fraction of the cost in cities—all through the progressiveness of some miller or manufacturer who enlarges his steam plant to make power for the whole town.

In many ways this popularity and cheapness of electricity in small towns has compensated for the lack of metropolitan conveniences. It has made the differences between city and country less sharply pronounced, and the telephone and electric railway have kept thousands of boys in the village and on the farm who otherwise would have escaped the dead-and-alive atmosphere for the crowded walks of metropolitan cities.—Chicago Tribune.

Building Collapsed.

Philadelphia, March 19.—A part of the new addition to the Fidelity Trust Company's building collapsed today, and killed Daniel Maginnis and George Whacklayer. The injured are Charles Anderson and Frank J. Borie.

To Survey for Canal.

Seattle, March 28.—This summer a survey of Lake Washington will be made, preliminary to the ultimate building of the long desired canal.

PLANS ARE ALTERED

Eye-Bolts Will Serve as Anchorage

Hubrick Encounters a Solid Face in the Bluff Without a Crack or Seam.

J. H. Hubrick, who is putting in the cable ferry across the Yukon, has recently altered his plans somewhat in regard to the anchorage on the west side of the river. He originally intended to drive a narrow tunnel in the bluff some 30 or 40 feet at the inner end of which a crosscut of probably 20 feet was to have been run. On the crosscut was to be constructed a massive "dead man" of logs and iron, around which the end of the cable was to have been anchored. The tunnel was begun several days ago and after being driven 14 feet all traces of any shak-

ing up the bluff ever having been entirely disappeared, the tunnel sent a solid wall without crack or a seam. Mr. Hubrick decided instead of using a "dead man" to anchor to be will employ a cluster of eye-bolts. Each bolt to be an inch and a quarter in diameter, seven feet in length and will be bedded in Portland cement in a drilled in the solid wall, the edge of which will be leaded. An arrangement it is claimed will give even greater solidity to cable than the scheme originally tended. Workmen are engaged putting in the "dead men" for anchorages for the cable and grouting on this side of the river and Hubrick expects to stretch the cable early next month.

Street Car Strike.

Norfolk, Va., March 18.—The employees of the local street car company declared a strike. About 200 men are involved. Cause of the trouble is an order recently issued by the directors requires all conductors and men to furnish bonds for their performance of their duties. The row, it is expected that the painters and track laborers will be out.

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