What Machinery Does.

There are men still living, and some of them may be met with on the streets of Chicago to-day, who remember the time when the laboring classes were in a comparatively helpless condition. They lived poorly; were awkwardly clothed, their garments of the coarsest material, and were content with fare limited in quantity and meager in quality. In the sense in which we to-day understand popular education, it was then unknown. The time of which we speak does not extend back to a period over sixty-five or seventy years ago. The workingman gained from the soil a scanty living, or toiled hard to produce it in ill-ventilated factories, aided by the rudest tools and devices; and when his wise fellows sought to lighten his task by labor-saving machines, he fought against them, precisely as some men do to-day, and with his own hands strengthened his shackles and renewed his fealty to honest manual toil without the aid of any new-fangled machinery, which he regarded with suspicion, and did not care to understand. One of the peculiarities of those days, however, was that the laboring man did not fly off at a tangent and enter upon a strike. There were no combinations formed then, not in this country at least, to compel employers to advance wages, or to dictate to an employe what he should or should not do.

The laboring man and mechanic struggled upward slowly, and was convinced only after he was defeated. Argument did not make him give up his prejudices, but facts did. When it was shown to him that a cotton gin could clean more cotton and do it better than his own hands, he very reluctantly admitted the fact, but denied the general application of it. He fought every improvement in his condition, as he would have fought an enemy, and not until his generation and succeeding ones had passed away was he slowly educated into the knowledge that machines could do more work, and do it better, than his hands. He regarded all labor-saving machines as so many enemies, eating up the bread of himself and his children, and crowding him out of the world, when the fact was then, as now, that they are his truest benefactors; instead of depressing his condition, they elevate it; instead of decreasing the demand for his services, they increase it.

Directly and indirectly, in a hundred diverse yet directly traceable ways, machines have been the truest friends of the human race. Men lose sight of these facts in the whirl and bustle of life. They accept the spectacle of the locomotive in place of the stage coach, the steamer instead of the sailing vessel, the telegraph in lieu of the mail, the modern Winchester rifle as a substitute for the flint lock musket, and yet fail to see how greatly these inventions have added to the blessings we now enjoy. By the development of the industries of this country, and not through the efforts of politicians, America stands the leading nation on the earth. The advances made in the past twenty-five or thirty years are truly wonderful, even to the expert; and what must they be then to those whose avocations lie elsewhere, and who know little of what is taking place in mechanics?

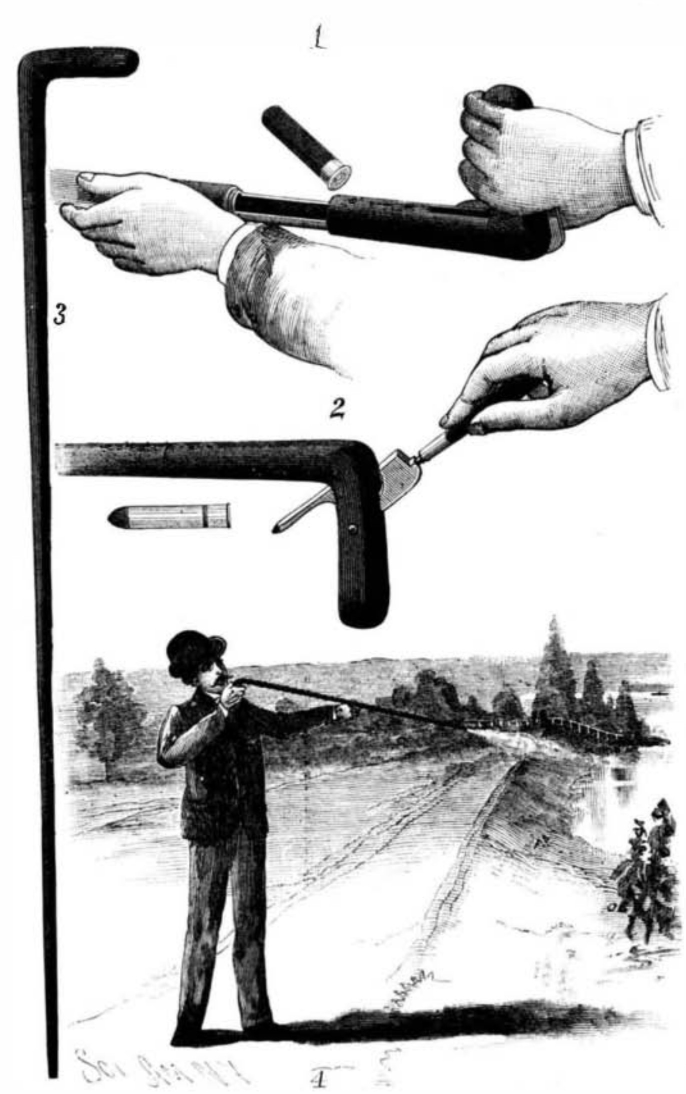
It is now possible to construct a complete sewing machine in a minute, or sixty in one hour; a reaper every fifteen minutes, or less; three hundred watches in a day, complete in all their appointments. More important than this even is the fact that it is possible to construct a locomotive in a day. From the plans of the draughtsman to the execution of them by the workmen, every wheel, lever, valve, and rod may be constructed from the metal to the engine intact.

Every rivet may be driven in the boiler, every tube in the tube sheets, and, from the smoke stack to the ash pan, a locomotive may be turned out in one working day, completely equipped, ready to do the work of a hundred horses. This is only possible by the use of machines, guided and controlled by human intelligence, by a close system of supervision, and accurate economy of time and force, and a thorough knowledge of business. As the number of machines annually produced, and the mechanical facilities for making them, are increased, statistics show that the number of workmen is always augmented. Machines do not supplant workmen, but create a demand for them. If a workman is taken away from one position, it is only to find employment in another contiguous one. The opponents of machinery may say that if machines had not been employed, more men would have been needed; but it is easy to see that the production would decrease, fewer machines would be made, and fewer men needed to make them; for it is the province of the machine to supplement man's labor, to elevate him, and to increase his earnings, instead of the reverse. A man with a pair of stocks and dies may cut, by hard labor and a low rate of wages, one hundred five-eighths of an inch bolts in one day; but give him a modern bolt-cutting machine, and he will cut four thousand bolts per day, and cut them better than with his hands alone.

The machine shop is one of the promoters of civilization. The arts of politicians are subordinate to it. Without the aid given by machines, their schemes would fall dead; without the locomotive and printing press, and the telegraph, they could not reach the ears of men in certain lines of thought. The ability to design a machine that will execute with automatic precision any given form requires a special development of brain power, and this development is by no means confined to the operator, but is shared by many persons. One machine leads to another, and as a consequence the intelligence of men turning out machinery of a high class is very marked, although they are unknown, for the most part, except locally. The machinist speaks through the work of his hand and brain. He adds to the population of the world when he sends forth a machine capable of increasing its working force; he frees his fellows from the bondage of mere handwork, and sets them higher problems to solve. In every way he advances the cause of his race, and leaves the world richer by his labors.—*Western Manufacturer.*

A WALKING STICK GUN.

The cane from which this illustration was made is apparently a plain, black walkingstick, although when taken in the hand it will be noticed that it is a little heavy, and the handle has a cold, metallic touch. Fig. 1 shows the removal of a cartridge that has been used,



A CANE THAT CAN BE USED AS A GUN.

and the aperture in which a fresh cartridge is placed in loading, this aperture being disclosed on pulling up or out on the handle when the trigger is at half cock. The trigger lies in the under side of the handle, and is made to obtrude therefrom, the hammer at the same time being lifted by the use of a small lever, about the size of a lead pencil, the point of which is inserted in a little hole at the bend in the handle, as shown in Fig. 2, this lever itself constituting the ferrule of the cane, in which capacity it prevents the mouth of the barrel from getting clogged up with dirt. To load this cane gun, the previous cartridge having been removed as stated, it is only necessary to put in a new cartridge, push the handle part and the main part of the cane together, and twist the handle till the two portions are in line, as shown by arrows. Unless these arrows are in line, the hammer will not work to discharge the cartridge, which is of the central fire pattern. There is no reason why a good specimen of firearms as well as a serviceable gun cannot be made after the manner shown in the article from which our drawings were made.

ACCORDING to a pamphlet on lubricators published by Messrs. MacArthur & Jackson, of Glasgow, a first class oil should stand exposure to a temperature of boiling water in a water bath of six hours without showing any appreciable loss by evaporation; its flashing point should not be below 300°; and it should not congeal at a temperature of several degrees below zero. For cylinder oils, whether pale or black, the flashing point should not be less than 500°.

Locomotive Headlights.

A statement purporting to have originated with "a railway official" is going the rounds of the press, in which the affirmation is made that there is more danger in the use than the absence of headlights on locomotives. It is admitted that the headlight is good on yard engines, but the alleged official is made to say:

"On a road engine the headlight is of no earthly use to the engineer; it obstructs the vision so that he cannot see his switch lights, and I think that every thinking engineer will come to the conclusion that he would rather run in the night without a lamp than with it, as he can see better in the dark. Red cannot be seen distinctly under such a powerful light when the engine is running rapidly. A green light under the brilliant illumination of a headlight appears yellow, and a blue light appears pale. I know of accidents which have occurred from this cause, and the eyesight of every engineer having a night run is put under a terrible strain by continually gazing ahead into such a light surrounded by such dense darkness. The new electric headlight put on the market a few years ago was a success as a light giver, but it has not been generally introduced, simply because railroad managers know that headlights on road locomotives are practically useless, and that a more powerful light would be positively dangerous."

Mr. Toucey, General Superintendent of the New York Central and Hudson River Railroad Company, says that "all that is simply nonsensical. The headlight is necessary, and this company recognizes that fact in its general rule that 'all trains and engines running after dark must display the white headlight in front of the engine.' As for that statement about the electric headlight, I am not aware that the electric headlight has ever been successfully applied for use on a locomotive. The oscillation and jarring of the engine would certainly have a tendency to throw the carbon points out of line, and that would stop the light. If that could be overcome, there would be no objection to its use in the fact of its greater brilliancy. It is not needed, however. The present light is brilliant enough, and is undoubtedly of service."

Mr. Wm. Buchanan, superintendent of motive power of the New York Central and Hudson River Railroad Company, said: "The road locomotive certainly needs a headlight when running into stations. And in going into and through a yard where there are several tracks, it is necessary to enable the engineer to see ahead that his track is clear and the switches set rightly. He is then, of course, going at a reduced rate of speed, and can stop if he sees anything wrong. While running on the road at full speed, the headlight throws its rays on the track so as to illuminate it clearly 150 or 200 feet ahead. Seeing that far would not give the engineer time to come to a full stop before reaching a sighted obstruction, for it takes six or eight hundred feet to halt a heavy train, dependent, of course, upon the grade and condition of the track, the speed and the weight of the train, but it would give him time to slow up very considerably and reduce danger. The headlight is useful in running through towns and villages, where speed is generally somewhat slackened, not only to enable the engineer to see what is ahead of him, but to give warning to persons on the track or near it of the approach of a locomotive, and to signal gatemen to close the approaches to roads on the grade of the track. As for the illumination from the headlight obstructing sight of the switch lights, that is not true. I have been a locomotive engineer and know that it is not, and if I were going out again to run an engine at night I am very sure that I would want a headlight. The colored switch lights are not in the line of white light thrown by the headlight, but to one side, and are seen clearly far beyond the limit that the headlight's rays reach. A red or green light can be distinguished a mile or a mile and a half away, while, as already said, the headlight only reaches 150 or 200 feet clearly."

In response to a question whether the whistle of a locomotive could not advantageously be done away with, Mr. Buchanan replied in the negative. It would always, he thought, be needed, so long as there are grade crossings. The bell is not always sufficient to give warning of the approach of a train.—*New York Sun.*

A New Solvent of Urinary Calculi.

At a recent meeting of the French Therapeutical Society, a specimen of pichu, or piche, was shown by M. Limousin. In its native country (Chili) it was believed to disintegrate urinary calculi. M. Limousin expressed the belief that piche acted especially on the mucin which held together the different elements of calculi and dissolved it, and lessened vesical catarrh, a belief which, in consequence of the resin it contained, was shared and confirmed by M. Dujardin-Beaumetz. A fluid extract has been prepared, of which four dessertspoonfuls represent 30 grm. of the plant—the dose generally administered in 24 hours.

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Some of the Papers Read before the American Association for the Advancement of Science, Buffalo Meeting, August, 1886.

In giving the titles and abstracts of papers, it is quite likely that some of the most meritorious of the 252 that were approved by the standing committee may be passed by, while others less deserving may be noticed. The object, however, is less to report the proceedings fully, than to give a few specimens of the work done in the different sections.

THE SOARING BIRDS.

A rather fanciful and highly wrought, yet interesting and suggestive, paper was read by Mr. I. Lancaster, of Chicago, who has for many years made a special study of the flight of birds. For five years he gave himself up to this problem during a residence in Southern Florida, where facilities for observation were remarkably abundant. Hidden by a mask of cotton fabric large enough to cover the whole person, and painted green and brown like the foliage of the trees in whose tops the observer took his stand, he was able to study more closely the mystery that seemed to set at defiance the laws of matter and motion, as the buzzards, gannets, and other soaring birds would lazily float within a few yards from his face, their wings as immovable as a pair of boards. The position of the wings was always on an incline that was highest in front, and the heavier the bird, the greater this inclination; but all birds seemed able to vary it at will. The relation of the wings to the bodies widely varied. Some birds carried them upward, with the tips above the bodies; while the frigate bird, on the contrary, bent them downward like a flattened letter *m*. Herons carry their bodies higher than their wings; while the sandhill crane keeps nearly on a level.

It was found that the soaring flight is carried on in wind or calm, the latter being best, and is generally done in circles. The bird can go with or against the wind, its power to move in the air being somehow derived from itself; and when this force is not exerted, it simply floats like a boat drifting with the tide. The crane lifts itself spirally to the height of 10,000 feet or more, and the buzzard translates himself three miles through air so calm that swan's down would fall vertically and a tissue paper balloon ascend straight into the sky.

After stating many facts of this nature and the problems thus arising, Mr. Lancaster claimed that he had constructed floating planes, or "effigies," with the under surface rough to motion from rear to front, but smooth the other way. He had made scores of them, which would float steadily in any ordinary breeze, and some of them that had been launched from the Egmont lighthouse might be floating yet if not capsized by storms. He watched one effigy as it traveled for three days. The application of all this, and much more, to the problem of aerial navigation led him to construct a large machine, ten feet by thirty-five, on which a man could ride when the wind blew at the rate of thirty-five miles an hour. Mr. Lancaster had a number of diagrams to explain his paper, after which it was understood that he was to exhibit his model and let it soar. But as said model was not forthcoming, disappointment grew to indignation, and members offered $1,000 for a model that would work.

The president of the association, Prof. Morse, attacked the principles and facts of the "soaring-birdman," moving a suspension of business that all might go out on the square and try a model. Great interest was excited, and multitudes were willing to be spectators of the remarkable performance. But Prof. Lancaster finally disclaimed a knowledge of mechanics, saying that he had made his models fly in Florida, and that his theory was demonstrated. Considering the extraordinary claims that had been made, and the amount of time consumed by the paper, the general feeling was that the gentleman should not have stood on his dignity, but should have gratified the association by launching at least a single little model.

COWLES ELECTRICAL FURNACE.

An account was given by Prof. Thurston of the colossal dynamo lately made by the Brush Electrical Company. [This machine was illustrated and described in last week's SCIENTIFIC AMERICAN.] A paper was also read by Prof. Maberry concerning the results of certain experiments made by the Cowles electrical furnace, for which the great dynamo, and other smaller ones, had been constructed. It had been found that the electrodes should enter the furnace at an angle of 35°, and that the charcoal should be coated with lime to increase its efficiency. By other improvements the furnace was enabled to utilize far more powerful currents than had formerly been possible.

The resources of the company have thus far been so occupied commercially, that less attention has been paid to scientific questions than might be desirable. There can be no doubt, by those familiar with aluminum, as to its peculiar properties that give it superior value over zinc, tin, and other metals with which it is sometimes compared. The statement that aluminum cannot be produced without copper is erroneous. This furnace has frequently produced it in large quantities. A remarkable effect was noticed when a bar of ten per cent aluminum bronze was heated very hot and then struck, the entire bar taking a crystalline condition. An ingot of metal exhibited showed less silicon and iron than the average commercial aluminum, and methods are being adopted that will greatly reduce its cost.

RIVER AND HARBOR IMPROVEMENTS,

with special reference to the New York entrance, was a paper of importance by L. M. Haupt. The author maintained that all structures of any considerable magnitude intended to regulate currents, and resting on sandy or alluvial bottoms, violated the fundamental requirement that they should not hinder the ingress of the tide nor injuriously modify the currents. Also, that dikes or jetties were, to a great extent, below the zero plane of action of waves of translation, and depended for strength on their mass, which was frequently made up of small fragments not cemented. Such constructions occupy a large volume, produce great pressure of leverage, result in serious modifications in rivers and harbors, are needlessly expensive, and cannot be readily changed if once wrongly located. Mr. Haupt's suggestion was a solution of all these difficulties by a floating system of deflectors attached to buoys or floats, and anchored to heavy moorings of ground chains, held by screw disks sunk in the bottom.

This system is to be guyed in place on the ebb side by wire cables, and depends on the tensile strength of wrought iron for its efficiency. Its parts can be readily assembled, occupy little space, admit the tides readily, yet practically control the currents and deflect them upon the obstructions to be removed. It is comparatively inexpensive, and can be quickly erected or taken down. The physical conditions of the problem at Gedney's Channel were stated, attention called to the existence of a peculiar deep basin on the bar, and the method of utilizing the cause that maintains it for the improvement of the channel. Various other plans for the New York harbor were commented on. Stress was laid on cutting only so much of the crest of the bar as would secure the requisite channel, as excessive cutting was a needless expense, and might injure other channels. Haupt's system depresses the plane of tidal scour on the bottom, while it increases the local volume of the stream, removes enough material to give a clear channel of thirty feet or more, and maintains it against the forces of the flood at a minimum of time and cost.

THE SOCIAL WASTE OF GREAT CITIES,

a paper read by S. L. Seaman, before the section of Economic Science, set forth facts of a startling nature, whether considered by the scientist or philanthropist. A great city is a body politic, having a legitimate waste attending its most thrifty growth, and likewise a pernicious waste that is a dead loss of social capital, threatening ultimate disintegration. A professional service of ten years in New York city, chiefly under the Board of Charities and Correction, enabled the writer to speak understandingly. The contrast was marked between the popular apathy as to the devastations of vice and crime and its dread of financial revulsions and pestilence, although the former causes more poverty, disease, and misery than the latter. The "waste" was signally illustrated by the fact that the chain of beautiful islands studding the eastern border of the metropolis for more than eighteen miles had been surrendered to the service of the criminal, abandoned, and pauper classes; and also by the incalculable outlay from the municipal treasury and private beneficence for the support of vice and crime, far beyond the cost of reparative and educational institutions. Besides the waste of land and money, there are 16,000 colonists on these islands, the ooze of the metropolis, and increasing with greater rapidity proportionally than the remaining population. The whole police are in necessary and congenital relation to this waste, which is the fatal price of crime. The sources of social waste are mostly hidden—under-paid labor, gangs of friendless children, hoodlums baffling the authorities, the army of tramps, those crippled in reckless competitions and financial disasters, badly managed labor disturbances, the heredity of vice, the practical helplessness of the fallen and the pauper class, the Old World drift of outcasts, the sewage of intemperance and debauchery. The first condition of reform and a masterly resistance to this waste lies in the selection, for official supervision, of cultured men versed in sociology, alive to the high functions of such a trust, and absolutely beyond the reach of all political entanglements.

THE BOTANICAL CLUB.

During the Minneapolis meeting, three years ago, permission was obtained to organize a botanical club in connection with the A. A. A. S., provided its meetings were not brought in conflict with those of the general association. Each year since has witnessed the growth of the club, until this year it held daily sessions from eight to ten A. M., and organized separate excursions and receptions, and the members were distinguished by badges. The general feeling is that this is all right, but is a new departure, and worthy of special comment.

THE NATIONAL MICROSCOPIC SOCIETY also meets at the same time and place with the general association. It is necessarily somewhat exclusive, and yet the intention is expressed of holding at least one open meeting during the sessions, to which all will be made welcome.

No decision was reached as to the next place of meeting, and it is a significant fact that no invitation came from any quarter. Possibly the unwieldy size and burdensome cost of these meetings furnish an explanation. And yet there is probably no cheaper way of disseminating science among the masses, and the necessary cost is no greater than that of many other popular gatherings whose burden is borne uncomplainingly. The fact having been stated that Prof. F. W. Putnam, the laborious permanent secretary, had advanced $3,000 to meet arrearages from year to year, led to the subscription of various liberal sums toward a fund to liquidate that indebtedness.

The officers chosen for next year are follows: President, S. P. Langley, of Alleghany, Pa.; Vice-Presidents, (A) Wm. Ferrel, (B) Wm. A. Anthony, (C) A. B. Prescott, (D) Eckley B. Coxe, (E) G. K. Gilbert, (F) W. G. Farlow, (H) D. G. Brinton, (I) Henry E. Alvord; Secretaries, F. W. Putnam, W. H. Pettee, J. C. Arthur, besides the secretaries of the sections; Treasurer, William Lilly, of Mauch Chunk, Pa.

Soda Locomotives.

The Philadelphia *Record* says: At the Baldwin Locomotive Works there are in course of construction four locomotives, which are designed to be run by soda, which takes the place of fire under the boiler. Soda has much the same power as coal, without any of the offensive gases which that fuel emits. The engines are now nearly finished, and are to be shipped within two weeks to Minneapolis, Minn., and are to be run on the streets of that city, where steam engines are forbidden.

The engine has much the same appearance as a passenger car. It is about 16 ft. long, entirely boxed in, with no visible smokestacks or pipes, as there is no exhaust or refuse. The boiler is of copper, 84½ in. in diameter and 15 ft. long, having tubes running through it as in steam boilers. Inside the boiler will be placed five tons of soda, which, upon being dampened by a jet of steam, produces an intense heat. When the soda is thoroughly saturated, which will occur in about six hours, the action ceases, and then it is necessary to restore it to its original state by forcing through the boiler a stream of superheated steam from a stationary boiler, which drives the moisture entirely from the soda, when it is again ready for use. The exhaust steam from the cylinders is used to saturate the soda, and by this means all refuse is used.

These engines are the first of their kind that have been built in this country, and are being constructed under the supervision of George Kuchler, a German engineer. The engines will have about the same power as those on the New York elevated roads, and will readily draw four light cars.

Soda engines are now used in Berlin and other European cities very successfully, and they also traverse the St. Gothard Tunnel, under the Alps, where the steam engines cannot be used, because the length of the tunnel renders it impossible to devise a system of ventilation which will carry off the foul gases generated by a locomotive. So overpowering would those gases become that suffocation would ensue.

A full account of the soda locomotives, with several illustrations, will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 483.

Open and Close Couplings.

Some very interesting experiments were made during the closing days of the brake tests at Burlington, Ia., to test the effect of open and close couplings upon the ability of a locomotive to start a train. This has been a matter of hot dispute betweed the link and hook coupler men for a good while, and it is strange that the matter was not long ago determined by actual experiments. At Burlington it was found that the locomotive could start on a lead 49 loaded cars close coupled and 48 with ordinary link and pin coupling. Afterward, on the grade, the engine started 38 cars with each method of coupling. The general results seem to establish the conclusion that the loose slack of open couplings is of no advantage in starting a long and heavy train, and that the draw-bar springs give all the slack that is needed. The trains run at the brake tests had loose slack as follows: Westinghouse, 10 ft. to 11 couplings; Eames, 11 ft. 5 in.; the American, 11 ft. 8 in., and the Widdefield & Button, 8 ft. 9 in. to the same number of couplings. This would give from 40 to 50 ft. of slack to be taken up before the draw-bar springs were moved in the fifty-car brake-test trains, an amount sufficient to cause the severe shocks of the stops. The results of these experiments are undeniably favorable to the hook coupler interests, though doubtless close couplings can be made with links as well. In the train used at Burlington, the loose slack was taken up by iron wedges in the links.

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