AMERICAN INDUSTRIES.—No. 37.

THE MANUFACTURE OF BOOK PAPER.

It is a remarkable circumstance that paper made from rags should have replaced parchment, papyrus, and the whole range of substances used for making records, and come into general use just at the time of the invention of printing, and it is singular that nothing but paper will answer the requirements of the printer.

It is impossible to place definitely the date of the invention of paper. It is one of the things that originated in the remote and hazy past, and like many other things connected with human economies it has been gradually developed and perfected until every condition and requirement in its use seem to have been fulfilled.

It is probable that the first paper from pulp was made in China, and that from thence the art spread over the world. It is not even known when or where linen paper was first made, but it was generally in use about the middle of the fourteenth century.

Until within about a hundred years all paper was made by hand by a slow and laborious process, the supply was naturally limited, and the quality necessarily lacking in uniformity; but the trade was completely revolutionized by the invention of the Fourdrinier machine, by Louis Robert, an employe in the paper manufactory of Francis Didot, in France, in the year 1798. The credit of making the machine practically useful belongs to the Messrs. Fourdrinier, of London, from whom the machine takes its name. The machine was improved in various ways until, in 1806, it was so far perfected as to reduce the cost of paper to about one quarter of the former price.

Within the last fifty years many important improvements have been made in the manufacture of paper. These include the pulp dressing machine; the steam driers attached to the Fourdrinier machine; the rotary cutters which cut the web into any required width, and many other minor yet essential improvements which conduce to the present perfection of paper-making machinery.

Another comparatively recent improvement is the machine for supercalendering, consisting of four paper rolls and four well polished iron rolls, arranged in alternation and placed vertically one over the other. These machines are used for glazing fine papers such as ledger, flat, writing, and fine printing papers. In some instances chilled iron calender rolls are attached to and form a part of the machine, but this arrangement is used only for the lower grades of paper.

Space will not permit of a detailed history of the paper making industry; we have therefore chosen a representative establishment to illustrate the development of this branch of manufacture.

The Albion Paper Company, of Holyoke, Mass., was organized in 1869, when they bought the old wooden mill formerly owned by the Hampden Paper Company of the same place. The mill then had a capacity of 3,500 lb., which was soon increased to 5,000 lb. daily, and the product was used in the manufacture of paper collars. About eight years since the product of the mill was changed to supercalendered book paper; and in 1878, a parcel of land with water power adjoining the old mill was acquired, and a new and extensive brick structure was erected and supplied with the most modern and improved machinery, capable of turning out five tons of paper daily. A year later a second mill similar to the first was built, and filled with the same kind and amount of machinery, excepting that three engines more were added and a few improvements were made. These buildings are shown in the bird's-eye view at the left of the large engraving.

The main mill is 330 feet long by 34 wide and two stories high, with basement and attic. The bleach boilers and rag engines are in the first story, while the second story and attic accommodate the arrangements for sorting and dusting rags. From this building two wings, each 34 feet wide, containing the machine rooms, extend forward 104 feet, and connect with a building parallel to the main mill and forming the street front of the whole structure, which is thus in the form of a quadrangle inclosing an open court. The front building is 210 feet long by 34 deep and two stories high, with attic. The front is relieved by a square tower in the middle, and a similar tower at the rear of the rear mill contains stairways and elevator.

The buildings are so planned that neither stock nor finished paper has to pass over the same ground twice. The Holyoke and Westfield Railroad discharges rags and other materials at the rear, which, in the process of manufacture, pass forward to the finishing room, from which the paper is shipped.

The equipment of machinery, all of which is made in Holyoke, is very complete and modern. Five steam boilers are used to supply the four rotary bleach boilers, each of which, 21 feet long, has a capacity of five tons of rags. The engine room, besides these bleach boilers, contains thirteen 1,000 pound engines and two Jordan engines. There are two Fourdrinier machines, one of 84 and the other of 86 inches; four stacks of supercalenders, 36 inch face, 9 rolls to the stack, one stack, 40 inches face, and a stack of sheet calenders; seven Hammond cutters, and two Cranston trimmers.

The water power from the second level canal is utilized by several of the Holyoke Machine Company's Hercules Wheels. The mill employs 265 hands. It makes some engine-sized flats, but is run mainly on fine book paper, all of which is supercalendered. The buildings are provided throughout with the new automatic sprinklers, which, in case of fire, floods the rooms the instant the heat becomes sufficient to melt the solder which holds the valve.

The material from which the paper is made, in its course through this manufactory, follows a regular order constantly advancing from the place of the entrance of the raw material to the place of exit of the finished product.

The stock is carried by elevators to the attic, where it is first put through an opener or duster, which whips out the greater portion of the dust contained by the rags, opens the folds, and puts them in condition to be examined and assorted. From the attic the stock is dropped to the floor below, where it is placed in baskets and distributed to women to be assorted and divested of buttons, hooks and eyes, pins, etc. After this it is spread out upon large tables and looked over carefully, and pieces of wood, rubber, and other substances likely to injure the paper are removed. The department in which this work is done is represented by one of the views in our engraving.

The stock is now carried forward to the cutting machine (shown in one of the smaller views), which rapidly cuts it up into small pieces, after which it is dusted and let down through hoppers in the floor into huge bleach boilers (shown in the engraving), where they are sealed up and subjected to the action of lime and steam for twelve to eighteen hours. These immense boilers are constantly revolved at a slow speed to bring all of the stock under the action of the bleaching agent.

After this operation the stock is conveyed to the washing engines, where it is washed for six or eight hours, according to the quality; it is then bleached by the application of bleaching powders, after which it is allowed to run through valves in the bottoms of the washers to brick drainers in the basement, where it is allowed to remain from two to four weeks.

The half-stock, as it is now called, is put into the beating engines, where the fiber is brought out to the required length. Of these machines the Albion Paper Company have six, also seven washers, making a total of thirteen. engines. The lower view in the engraving represents the long row of engines used in the establishment. In these engines the rags are drawn between the cutters on the large revolving cylinder and the stationary cutters in the bottom of the vat, and are torn into the finest filaments. The stock goes round and round in this machine, being acted upon by the cutters again and again, the huge cylinder carrying the cutters being meanwhile gradually lowered by the mechanism seen at the side of the vat, until the stock is reduced to a fine pulp. The thin pulp is allowed to run out of the engines into wooden chests, whence it is pumped up into the tank of the Fourdrinier machines. From this tank the pulp flows into a small chamber, where it is kept in constant agitation until it flows out over a channeled plate—upon which extraneous matters of greater specific gravity than the pulp are arrested—and is delivered to an endless wire cloth apron, which is continually agitated to insure an even distribution of the pulp fiber. The wire cloth apron is supported on a series of small rollers, and the width of the paper is governed by deckle straps at each side. The wire cloth apron passes over a box in which a partial vacuum is maintained, which withdraws a part of the moisture from the paper as it passes over the box.

The paper is delivered by the wire cloth apron to a felt apron, which conveys it to the first pair of press rolls which expel the moisture and deliver it to an apron which carries it forward to a second pair of press rolls, where more of the moisture is removed and the web is still further compressed; it is then passed to another blanket which delivers it to a series of steam-heated rolls. These rolls, as well as the other portions of this machine, must move in absolute harmony, and the mechanism must be of the most perfect character to handle the thin and extremely tender web of moist paper. The paper, as it is delivered by the machine, is in rolls. This mill has two Fourdrinier machines, one producing paper 76 inches wide, the other 79 inches wide. These machines are of Rice, Barton & Co.'s make. The paper is cut into different widths, as it is delivered to the reels, according to the requirements.

The finishing room adjoins the machine room, and all of the paper is passed through the calender rolls until a high finish is obtained.

The machinery of the Albion mills consists of 13 (1,000 lb. each) engines; two Jordan engines: four rotary boilers for rags having a capacity of five tons each: two Fourdrinier paper machines (84 and 86 inches wide). The calenders consist of four stacks having 9 rolls each, 36 inches wide; one stack 40 inches wide; one stack for calendering sheets.

The capacity of the mills is twelve tons of book paper per day.

The water supply, which must of necessity be pure and clean, is derived from driven wells, 115 in number.

The officers of the company are as follows: Calvin Taft, President; Edward C. Taft, Treasurer and Agent; A. H. Page, Clerk. These gentlemen also comprise the stockholders of the company. The entire mill is under the management of Mr. William Reardon.

Habits of Fishes.

It has been long known that fishes return to about the same place in the same rivers each year to spawn, but it is a recent discovery that they go up the left hand side of the stream and coming down take the opposite side Fisher men may be benefited by remembering this.

Correspondence.

The Value of Vaccination.

To the Editor of the Scientific American:

Your issue of March 6 contains a letter from an English correspondent upon the subject of vaccination. Without going over the immaterial portions of his letter, those only of importance are, first, in relation to bovine and humanized lymph. Are they equivalent, and is vaccination performed with one considered equally protective by those who believe in vaccination as that performed with the other? He smites the air vigorously to establish what no one denies, namely, that they are equivalent and equally protective. Having gained this important vantage ground, he proceeds, in the second place, to show by statistics from various hospitals of Great Britain, that during ten years, irregularly and imperfectly observed, 37,636 cases of smallpox occurred, and that 28,468 of these were reported as vaccinated. This he brings forward as irrefragable proof that vaccination is an "unparalleled failure."

Now, this is the statement which in some form or other has been put forward as the strong argument against vaccination ever since agitation of the subject commenced.

Simply stated, it is this, that three-fourths of all the cases of smallpox treated in the hospitals of Great Britain have been vaccinated, consequently vaccination is valueless. Let us examine this statement, and in order to do so it is necessary first to determine what constitutes vaccination. In the January number of the *Popular Science Monthly* for the current year is an article entitled "Vaccination in New York." It is a statement of the methods and results of vaccination as practiced in this city, in contrast with the statements of Mr. Moncure D. Conway regarding the results, as he pictures them, in Europe, and especially in England.

I have there given the careful and exact methods of vaccination as practiced by the vaccinating corps of the Board of Health of New York, and a large class of intelligent practitioners of medicine, and the results obtained in the way of protection.

These results concisely stated are as follows: Vaccination, in order to be protective, should be done with eight-day lymph, either from a healthy infant or from the calf. The vesicle should be characteristically perfect on that day. The vaccination so performed should produce a similar perfect vesicle upon the eighth day and run its normal course.

Those who have given their attention almost exclusively to this subject for the past ten years, in connection with the Board of Health and in public institutions, recording cases and noting their behavior when subsequently exposed to smallpox, unhesitatingly declare their belief that such vaccinations are a perfect protection against the disease; at least to the same extent as though it had been experienced.

In support of this statement and belief numerous cases are cited, and the number could be *indefinitely increased* where, during the epidemic of 1874–5, among members of the same family, the unvaccinated, almost uniformly, when exposed, took the disease, while there is not a case of an individual who, having received the inspector's certificate of vaccination, subsequently contracted the disease, even though living for days in close rooms where it existed.

Another remarkable fact bearing upon this subject is the following, as reported by Dr. Taylor, Inspector of Vaccination. It was the custom, during the epidemic of 1874–5, where a mother having an infant at the breast was attacked by the disease, and was obliged to go to hospital, to immediately vaccinate the infant, and then send both mother and child to the smallpox hospital, a place at that time crowded with cases of the disease in every stage of progress. As a result of this procedure not a single infant so treated took the disease, notwithstanding the fact that the infant was nursed by the mother throughout her illness.

The belief of those who have been the most diligent students in this matter, is that one perfect vaccination protects through life; nevertheless a certain small percentage of those vaccinated in infancy only take the disease when exposed in later life. It is therefore advised that children vaccinated in infancy be revaccinated about the fifth or sixth year. So also as a safeguard against possible infection it is advisable that vaccination even in adults should be repeated, and especially at some time of unusual exposure, such, for instance, as must occur in epidemics of the disease.

It is not claimed that the rule of protection is absolute and without exception, any more than other rules and laws in the economy of nature. The fact of having once had smallpox is usually considered the best possible protection against future attacks; and yet cases occur where the disease is experienced twice and even more times by the same individual.

So persons who have been vaccinated according to the suggestions above laid down are considered thoroughly protected, though one case of smallpox in a very great number might possibly occur among them.

It is only persons who have been so vaccinated, and who have received all the protection which vaccination is capable of affording, who can properly be counted in arranging statistics upon this subject.

Now, what knowledge has your English correspondent concerning the 28,468 cases of smallpox which are reported as vaccinated? How many of these have ever *really* been vaccinated? How many of those really vaccinated have fulfilled the conditions necessary to thorough protection by the perfection of the virus used, a proper method of vaccination, and, if necessary, revaccination? How many belong to the class which even smallpox itself does not protect from a second attack? Unless your correspondent is informed upon these points his statistics are useless. Yet it is just such loose statements and unreliable statistics as these that are constantly and invariably brought to bear as strong arguments against vaccination. They are specious, and perhaps calculated to deceive the multitude, but they betray that ignorance both of the subject and the proper use of statistics which certainly characterizes most of those writers and agitators who are at present directing their efforts against vaccination. R. OSGOOD MASON, M.D.

64 West 20th St., New York.

Dangers of Fire from Steam Pipes.

To the Editor of the Scientific American:

I would have replied ere this to Mr. Atkinson's letter, which appeared in your paper of February 21, were it not that I wished to complete some experiments on the ignition of wood and charcoal, the results of which I give you below; but before going further, it would be well to define the difference between seasoned wood, charred wood, and charcoal.

The first admits of no degree; it is simply wood with the sap and the excess of moisture, above what would be incidental to the hygrometric state of the atmosphere.

The second admits of degree, and is wood with the hydrocarbons partly driven off, according to the completeness of the charring.

The third admits of no degree, and is nearly pure carbon and ashes.

I inclosed a two inch cube of white pine wood within a small gas pipe retort, with a bit of solder (one-third tin and two-thirds lead) and a bit of sheet lead, and placed the retort in a boiler tube for five days, boiler going day and night. At the end of that time the wood was pure charcoal, the solder was melted, and the lead was not, which goes to show pure charcoal can be made at a temperature between 500° and 612° Fahr.

To prove the above was pure charcoal, *i. e.*, that all the hydrocarbon was driven off, I raised the temperature of the retort to about 1,200°, but could not drive off any more gas.

In October, 1877, I inclosed pine laths against the shell of a horizontal boiler, and covered them with a course of brick on edge. The pressure of steam in this boiler has been 40 to 60 lb. day and night since, except one day a month for cleaning. The ends of the laths that came out to the air and flush with the brickwork, are not near as dark as hemlock tanned-leather, and the darkest part I could find which was entirely covered with brick is not as dark as roasted coffee. This goes to show charcoal cannot be made at 300° Fahr., after two and a half years, under the most favorable circumstances, with a furnace fire only five feet beneath it.

To prove this wood was not charcoal, I placed it in a retort and drove off gas that burned with nearly as much light as illuminating gas, when it leaves the retort.

In experiments on the ignition of charcoal, I found that the charcoal made in the boiler tube would not redden at the melting point of lead (612° Fahr), but would at a lower temperature than zinc (770° Fahr.).

My mode of operation was this way. I passed a gas pipe through a fire and blew pure air through the pipe. I also prepared myself with long slender strips of solder (half and half, and one-third tin and two-thirds lead), and with strips of lead and zinc, and pine shavings, and small pieces of the laths and charcoal.

The pure charcoal would not redden in the same blast that just melted the lead, but did in a blast which melted it rapidly. When held in a blast which melted solder (one-third tin and two-thirds lead, melting temperature about 500° Fahr.), it showed no signs of fire or redness.

The lath, which was two and a half years in contact with the boiler under a course of brick, would become charcoal in a temperature which melted half and half solder, but would not get a spark on it until I increased the temperature to where the needle of lead bent and dropped. The same with a nicely prepared splinter of white pine, in which I could see no deviation in the action from the splinter of the lath; they all became charred in the blast which melted half and half solder, but would not take on a spark until the lead melted.

With a blast that fused a metal 19 parts tin, 31 lead, and 50 bismuth, melting temperature about 212° Fahr., I could not turn tissue paper brown.

Gunpowder held in the blast which melted the lead did not explode until after the lead melted. It gave off a slight blue sulphurous light first, then the lead melted, and an instant after the powder exploded.

The statement I made in my first letter I now repeat, "that the temperature at which wood and charcoal fire is between 500° and 700° Fahr.," and that the purer the charcoal the higher the temperature required.

Illuminating gas will not take fire from a cherry red poker, but will from a bright red one.

The gas of wood, crude petroleum, soft coal, or any other hydrocarbon, will not take fire when escaping hot from the retort. With a cherry red poker I have tried the three mentioned.

I now wish to say that it was not my intention to make any of the readers of your journal careless in construction, and I would be sorry should my remarks, in answer to Mr. Smith's letter, be the cause of loss to any of them.

I know insurance companies act on the principle that "prevention is better than cure," and that the results in many cases justify their acts few will deny; but questions of fact must be answered yes or no, and not by the *modus vivendi* of the insurance agent.

I will comment on the points in Mr. Atkinson's letter as they occur, and will then try to show where the real danger lies in the use of boilers and steam pipes.

Is it not more likely that the wood of the "open boiling keir" was darkened in color by the oxide of iron from the nails than charred by the temperature of boiling water at atmospheric pressure, conducted through the length of the nails into the wood, and is not this *rusty* appearance often taken for charring?

The "fine charcoal" under some conditions might be classed with damp cotton, slack of soft coal, or lampblack; but while workmen are allowed to carry matches in their vest pockets, it would be safer to associate it with the matches, especially in the face of all the steam pipes that are packed in charcoal, and one in particular in California, where high pressure steam is carried 2,600 feet into a mine packed in charcoal.

The steam pipe "through the sill" prepared it for fire by drying it, and the dropping of a match, the fire from a cigar, or the superheating of the steam by getting low water in the boiler, could start it into active combustion. The same remarks will apply to the floor beam.

"Oiled waste cotton or wool and greasy overalls" have taken fire from being locked in a tool chest, *without* the aid of a steam pipe.

I will now endeavor to show why any one, whether insured or not, should comply with the requirements of the underwriters with regard to steam pipes and boilers, especially the latter.

When a journeyman, working in New York city, I was sent to John Hecker's house, in great haste, to see what the matter was with the steam heating apparatus. As soon as I entered the hall door I "smelled a burned boiler," and when I reached the boiler room I saw one. The generator was a sectional pipe boiler, and was red hot, with the pipes badly warped, and the fire still in the furnace. Upon investigation I found that the hair felt and canvas covering was charred through, the latter being as brown and crisp as burned leather for a distance of about fifteen feet, and beyond that, for about fifteen more, it showed signs of charring, lessening with the distance. It surprised me the house did not take fire, for, instead of having steam at a *maximum density* in the pipes, it was at first *superheated* (cause, very little water in the boiler), and as the pressure found vent through the burned boiler (as some of the tubes were burned through), it must have been red hot air or gas which filled the pipes, and nothing but the want of circulation prevented it from carrying the heat to the small uncovered pipes throughout the house.

This is not the only case that came under my notice. The First National Bank of Pittsburg had nearly the same experience when the janitor, in the fall of the year, fired two horizontal multitubular boilers for three hours (8 A.M. to 11 A.M.) before he discovered anything wrong. He then came to look for me, and did not find me until 1 P.M. The boilers were still hot, and the uncovered pipes near the boilers were turned blue black, the same as if they had just left the welding furnace and cooled; but where they were covered, the composition did not fall off, it being one of the lime and asbestos mixtures. Another case was a private house in Detroit, where the blow-off cock was opened maliciously, and the Chalmer-Spence covering was charred and destroyed, and had to be replaced on the boiler, and for about six feet beyond it on the main steam pipe.

I cite the above to show there is danger from superheated steampipes, and though the superheating of pipes is not an every day occurrence, it is safe to say they are more frequent than boiler explosions.

The following, though not generally recognized, often cause fires:

(1) The sudden closing of a damper on a fresh fire is apt to send flame or sparks through any cracks in the brickwork of a boiler.

(2) A *back draught.* The explosion of carbonic oxide, which sometimes takes place when any one opens the furnace door and admits air, where a lazy fireman has heaped coal on a dirty fire, which partly decomposes the coal by the heat of the fuel already in, but does not produce complete combustion for the want of sufficient air.

(3) The leaving of *banked fires* over night, with doors open or partly open, and dampers shut or partly shut, which, under some conditions, make small explosions of gas or throw hot coals by the bursting of slate in the fire out through the door.

The raking out the remnant of a wood fire at quitting time, which, though it be ever so well done, is attended with great danger from sparks.

The excessive heat from upright boilers, smoke pipes.

The taking fire of soot, of soft coal, or wood, which will never show itself, or never can assume active combustion, when the fire in the furnace is going, as the carbonic acid gas from one fire will not support a second in the smoke pipe; but should the first fire be low or out, the air will pass rich in oxygen to the second, and redden it, thereby heating the smoke pipe.

WM. J. BALDWIN.

ELMIRA, N. Y., March 13th, 1880.

Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they will enable the observer to recognize the planets. M. M.

POSITIONS OF PLANETS FOR APRIL, 1880.

Mercury.

Mercury rises before the sun on April 1, but so near to the sun that it is not likely to be seen.

Mercury will be near Jupiter on the morning of the 8th, near Venus on the morning of the 15th, and will be at the greatest elongation west on the 26th. It rises at that time nearly an hour before the sun, and should be looked for about 12° south of the point of sunrise.

Venus.

Venus rises on April 1 at 4h. 51m. A.M. Venus will be near Mercury on the morning of the 15th, and near Jupiter eight hours later.

On April 30 Venus rises at 4h. 19m. A.M., nearly at the same hour at which Saturn rises, Venus being north of Saturn.

Mars.

Mars is the only planet visible to the eye which can be seen in the evening.

Its motions can be followed by connecting it with prominent stars in the constellations of Taurus and Gemini. On April 1 Mars rises at 9h. 15m. A.M., and sets 32m. after midnight. At meridian passage on April 1 Mars is 4° east of Beta Tauri, and 3° below the star in altitude. The crescent moon passes Mars on April 15.

On April 17 Mars will pass Mu Geminorum 2½° above the star. On the 23d Mars will pass Gamma Geminorum 8½° above the star. On April 26 Mars will have the same right ascension with Sirius, but will be more than 40° above Sirius.

On April 30 Mars rises at 8h. 36m. A.M., and sets at 11h. 48m. P.M.

Jupiter.

Jupiter ranges so nearly with the sun that it is not likely to be seen until the latter part of April, when it should be looked for before sunrise. Jupiter will be near Venus April 15. Jupiter rises on April 30 at 3h. 44m. A.M., almost exactly in the East.

Saturn.

Saturn rises so nearly with the sun that it is not likely to be seen during the early part of April.

Venus, Saturn, and Mercury rise nearly at the same time on April 30.

Uranus.

Uranus is in very good position for amateur astronomers, and is easily found with small telescopes. On April 1 it passes the meridian at 9h. 47m. P.M., at an altitude, in this latitude, of 58°. It has nearly the same right ascension as Rho Leonis all through the month; it is ⅓° above this star on April 1, and ½° above it on April 30.

A telescope of low power, which would give a large field of view, would bring the star and the planet into the field together.

Uranus may also be found 6½° east of Regulus, and 2° south of that bright star, early in the month.

39½ Messages an Hour.

The following are the best total records of the Western Union main office operations from February 1 to 15 inclusive:

DAY FORCE (PRINTERS).

Calvert	4,523	Noyes	3,577
Miler	3,596		

MORSE.

McLaren	3,795	Allen	3,583
Irving	3,698	Barberie	3,458
Harmon	3,644	P. J. Tierney	2,962
Brick	3,634	Hutchinson	2,979

NIGHT FORCE (MORSE).

Shain	4,078	Robinson	3,256
R. W. Martin	3,542	Case	3,177
Anson	3,374	Hinman	3,027
Sabine	3,313	Risdon	3,309

The highest average was made by Printing Operator Calvert, which was 39½ messages per hour.

Leif Ericsson's Wild Oats.

Mr. Ernest Frölich, of Christiana, Norway, thinks he has found in our Indian rice a living proof of the truth of Snorre Sturlson's history of Leif Ericsson's visits to this country nearly nine hundred years ago. The voyagers reported finding in Vinland not only an abundance of wild grapes, but a kind of grain which they called wild oats, growing plentifully along the marshy river sides. This grain, which they said the natives used for food, can be no other he thinks, than the well known Indian rice, or wild rye (*Zizania*), which grows almost everywhere along the swampy borders of our coast streams as well as around inland lakes and ponds. Mr. Frölich proposes to follow the example of our Western game preserving associations, who are sowing wild rice in our marshes for the benefit of wild fowl, by sending home seed for planting on Norwegian marsh lands and moors.

Rapid Railway Building.

The greatest feat in the way of rapid railway making is said to be that of Sir R. Temple, in the late Afghan campaign. One hundred and thirty miles of railway was constructed in one hundred and one days.