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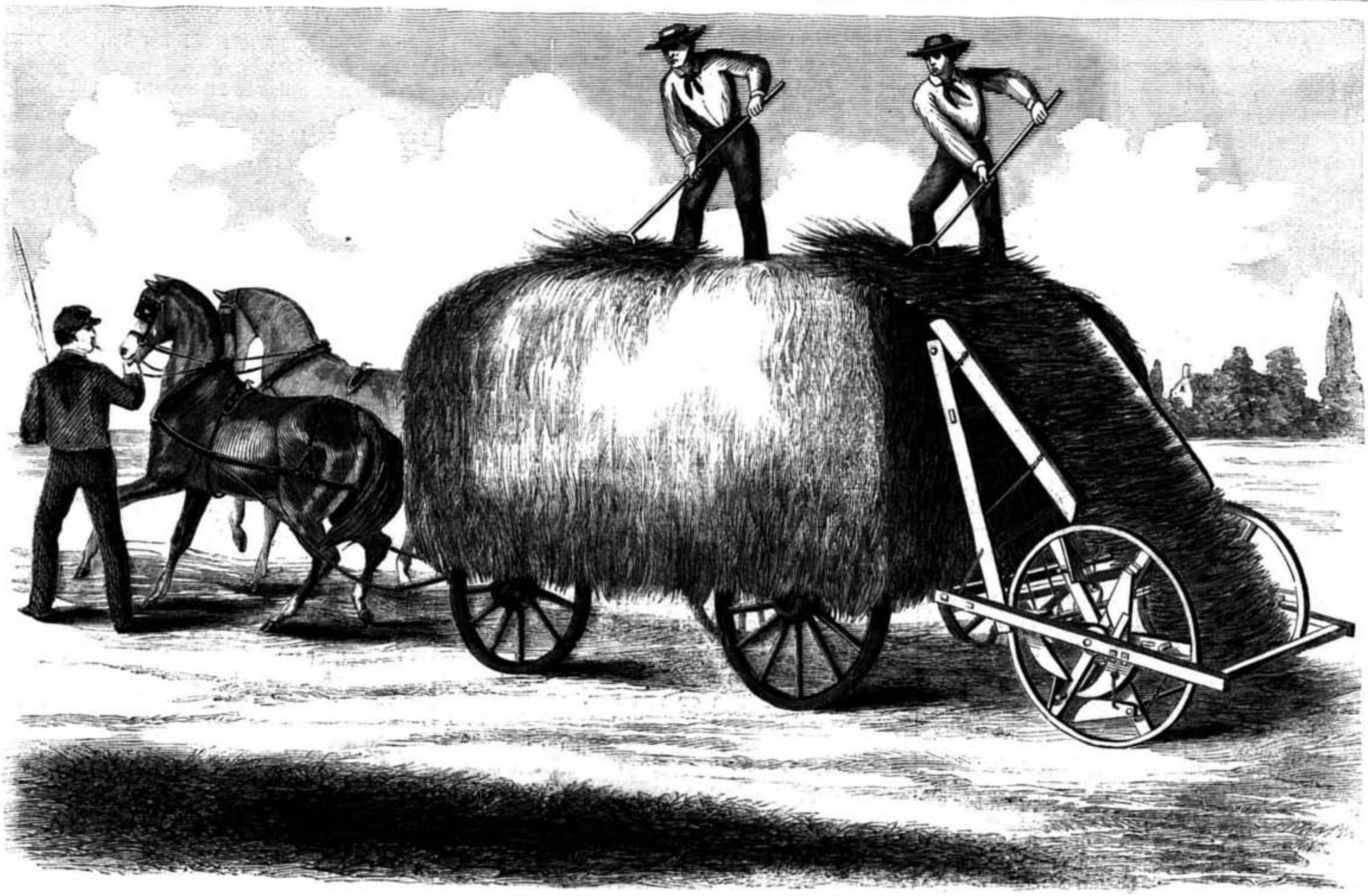

FOUST'S MACHINE FOR LOADING HAY.

Our engravings represent a new and improved machine for loading hay. It is intended to expedite the work and relieve men from performing this labor, so that they can attend to other duties.

In the large engraving, our artist has given a view of the hayfield with the machine attached to the back of the wagon and men on top stowing the load. In Fig. 2 the machine is shown distinctly with all its parts complete.

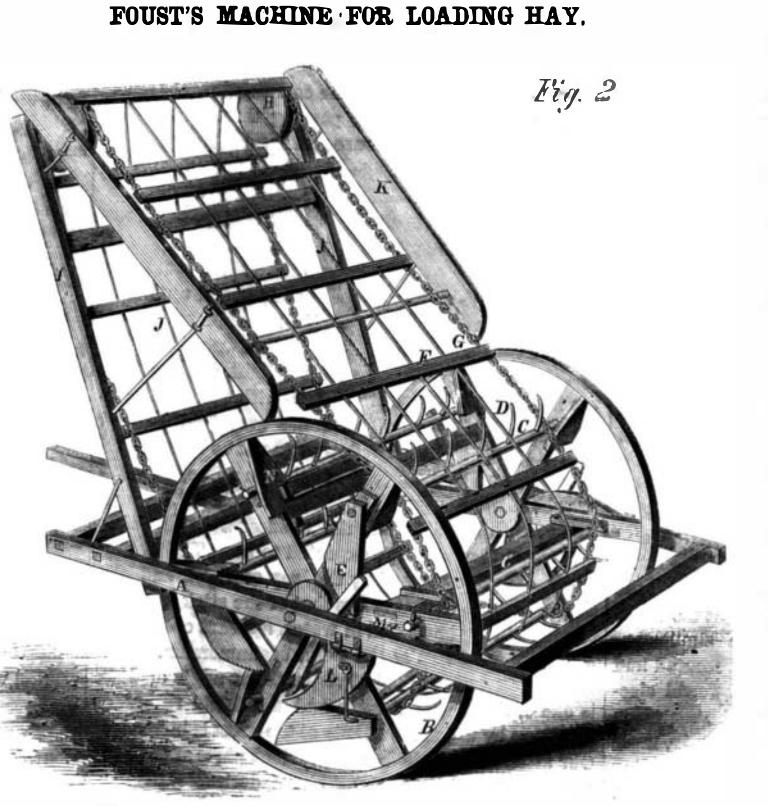

Fig. 2

The principle of this machine is comprised in a revolving drum fitted with a series of toothed or forked shafts, which, in rotating, gather up the hay from the windrow, and, aided by an endless apron formed of slats and cords, carry the hay to the wagon or rack, where it is compactly loaded as shown.

In Fig. 2, the frame A, is supported by the axle on the drum or wheels, B. These wheels run on the ground and have the shafts C fitted in the arms of the wheel. On these shafts the metallic forks D, which lift the hay, are set. If the reader will look on the ends of the shafts, he will see that every alternate one on each side has an arm, E, attached to it. These arms are weighted at the outer ends and by their action cause the forks to clasp the hay as it is drawn up and hold it so that it it will not be scattered about or clog in the machine. As the forks come up on the back end of the machine the counter-balanced arms, E, fall down perpendicularly, thus throwing the shaft and forks with their loads over against the bars F. These bars are connected to chains, G, which run over pulleys, H, in the uprights I. As the machine advances and the forks pass round with the wheels, these bars strip the hay off the forks, and carry it up on the cords J, to the top of the machine; from thence it falls in the wagon below.

The side boards K prevent the hay from being scattered about in its ascent.

There are also two pendants, L, one on each side, which prevent the machine from acting when they are turned down as shown; they may be turned up and connected to frame A by means of the hook attached to them, when it is desired to continue loading the wagon. By this arrangement the team can be backed without disarranging the other parts of the machine, and the forks be prevented from acting when it is desired to go from one field to another, or over parts of the same ground from which the hay has already been removed. The fork-shafts have small pins in them which strike other pins, M, in the frame, and regulate the point at which the forks stop. The pendant arms have also stops at N, so that they will not carry the forks beyond the reach of the slats or bars.

A patent was procured on this invention through the Scientific American Patent Agency, on November 18, 1862. For further information address the inventor, Mr. J. W. Foust, at Evansburgh, Crawford Co., Pa.

SOME weeks ago, a New York rogue sent circulars about the country, offering a choice steel-plate engraving of Gen. Jackson for the low price of 25 cents. Those who sent the quarter received in due time a two-cent postage stamp.

THE DISCOVERIES OF 1863.

We have received from the editor, the "Annual of Scientific Discovery or Year-Book of Facts in Science and Art for 1864." This is a volume of 350 pages being bound in uniform style with the preceding volumes of the series. It is ably edited by David A. Wells, A. M., M. D., author of "Principles of Natural Philosophy," "Principles of Chemistry," "First Principles of Geology, &c., It is published by Gould and Lincoln, Boston. The following extracts will give a good idea of the book, which we recommend as useful and entertaining to all persons interested in the progress of science, art, and mechanics :—

RAILWAY TUNNELS IN GREAT BRITAIN.

At a recent meeting of the Institution of Civil Enginners, Mr. J. S. Fraser stated that the aggregate length of the tunnels, now daily traversed by railway trains in the United Kingdom, amounts to eighty miles; and, supposing their cost to have been on an average fifteen pounds on a lineal yard, their construction must have caused the expenditure of six and a half millions sterling—equal to $400,000 per mile.

REPAIRING THE SILVERING OF LOOKING-GLASSES.

The repairing of the silvering on the backs of looking-glasses has hitherto been considered a very difficult operation. A new and very simple method, however, has been described before the Polytechnic Society of Leipsic. It is as follows: clean the bare portion of the glass by rubbing it gently with fine cotton taking care to remove any trace of dust and grease. If this cleaning be not done very carefully, defects will appear around the place repaired. With the point of your knife cut upon the back of another looking-glass around a portion of the silvering of the required form, but a little larger. Upon it place a small drop of mercury; a drop the size of a pin's head will be sufficient for a surface equal to the size of the nail. The mercury spreads immediately, penetrates the amalgam to where it was cut off with the knife, and the required piece may now be lifted and removed to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton; it hardens almost immediately, and the glass presents the same appearance as a new one.—*Builder*.

CURIOUS ELECTRICAL PHENOMENA.

Prof. Tyndall publishes the following account of some curious electrical phenomena observed by Mr. R. Watson, and a party of tourists in ascending a portion of the Jungfrau mountain in Switzerland. Mr. W. in a letter to Prof. Tyndall says : "On the 10th of July, 1863, I visited with a party of three, and two guides, the Col de la Jungfrau. The early morning was bright, and gave promise of a fine day, but, as we approached the Col, clouds settled down upon it, and, on reaching it, we encountered so severe a storm of wind, snow and hail, that we were unable to stay more than a few minutes. As we descended, the snow continued to fall so densely that we lost our way and, for some time, we were wandering up the Lotsch Sattel. We had hardly discovered our mistake when a loud peal of thunder was heard, and shortly after I observed that a strange singing sound, like that of a kettle, was issuing from my alpenstock. We halted, and finding that all the axes and stocks emitted the same sound, stuck them into the snow. The guide from the hotel now pulled off his cap, shouting that his head burned; and his head was seen to have a similar appearance to that which it would have presented had he been on an insulated stool, under a powerful electric machine. We all of us experiencedthe sensation of pricking or burning in some part of the body, more especially in the head and face, my hair also standing on end in an uncomfortable but very amusing manner. The snow gave out a hissing as though a heavy shower of hail were falling; the veil on the 'wide-awake' of one of the party stood upright in the air, and on waving our hands, the singing sound issued largely from the fingers. Whenever a peal of thunder was heard, the phenomena ceased, to be resumed before the echoes had died away. At these times, we felt shocks, more or less violent, in those portions of the body which were most affected. By one of these, my right arm was paralyzed so completely that I could neither use nor raise it for several minutes, and I suffered much pain in it at the shoulder-joint for several hours. At half-past twelve, the clouds began to pass away, and the phenomena finally ceased, having lasted twenty-five minutes. We saw no lightning, and were puzzled at first as to whether we should be afraid or amused."

THE TENEBROSCOPE FOR PROVING THE INVISIBILITY OF LIGHT.

At the last meeting of the British Association, the Abbe Moigno exhibited and described an instrument invented by M. Soleil, of Paris, for illustrating the invisibility of light, and called the "Tenebroscope." It is well known to scientific men, although the general public do not sufficiently appreciate the fact, that light in itself is invisible unless the eye be so placed as to receive the rays as they approach it, or unless some object be placed in its course, from whose surface the light may be reflected to the eye, which will generally thus give notice of the presence of that object. Thus, if a strong beam of sunlight be admitted into a darkened chamber through a small opening, and received on some blackened surface placed against the opposite wall, the entire chamber will remain in perfect darkness, and all the objects in it invisible, except in as far as small motes floating in the air mark the course of the sunbeam by reflecting portions of its light. Upon projecting a fluid or small dust across the course of the beam its presence also becomes perceptible. The instrument exhibited consisted of a tube with an opening at one end to be looked into, the other end closed, the inside well blackened, and a wide opening across the tube to admit strong light to pass only across. On looking in, all is perfectly dark, but a small trigger raises at pleasure a small ivory ball into the course of the rays, and its presence instantly reveals the existence of the crossing beam by reflecting a portion of its light.

SOME PHENOMENA PRODUCED BY THE REFRACTIVE POWER OF THE EYE.

In a paper read before the British Association, 1863, by Mr. A. Claudet, the author gave an explanation of several effects of the refraction of light through the eye; one of which is, that objects situated a little behind us are seen as if they were on a straight line from right to left. Another, that the pictures of external objects which are represented on the retina, are included in an angle much larger than one-half of the sphere at the centre of which the observer is placed ; from this point of view a single glance encompasses a vast and splendid panorama extending to an angle of 200°. This is the result of the common law of refraction. All the rays of light passing through the cornea to the crystalline lens are more and more refracted in proportion to the angle at which they strike the spherical surface of the cornea. Consequently, the only objects which are seen in their true position are those entering the eye in the direction of the optic axis. By this refraction, the rays which enter the eye at an angle of 90° are bent at 10°, and appear to come from an angle of 80°. This phenomenon produces a very curious illusion. When we are lighted by the sun, the moon or any other light, if we endeavor to place ourselves in a line with the light and the shadow of our body, we are surprised to find that the light and the shadow seem not to be connected at all, and that, instead of being in a line, they appear bent to an angle of 168° instead of 180°, so that we see both the light and the shadow a little before us, where they are not expected to be. The eye refracts the line formed by the ray of light, and the shadow and the effect is like that of the stick, one-half of which being immersed in water, appears crooked or bent into an angle at the point of immersion. This enlargement of the field of vision to an angle of 200° is one of those innumerable and wonderful resources of nature by which the beauty of the effect is increased. Our attention is called to the various parts of the panorama which appear in any way a desirable point of observation, and we are warned of any danger from objects coming to us in the most oblique direction. These advantages are particularly felt in our crowded towns, where we are obliged to be constantly on the lookout for all that is passing around us.

THE CHEMISTRY OF GUN-COTTON.

All vegetables, from the cabbage to the oak, are built up of little sacs or cells. Some of these cells, as those in the pulp of the orange, are visible to the naked eye, being $\frac{1}{25}$ of an inch in diameter; others are but $\frac{1}{1500}$ of an inch in diameter, and can be seen only by means of a compound microscope. The walls of these cells, in whatever plant they may be found, are always composed of the same elements combined in the same proportions; forming a definite chemical compound, which has received the name of cellulose.

In some plants the cell walls form a very small quantity of matter in proportion to the contents of the cells, in others they form a very large proportion. The cellulose in the beet-root is but 3 per cent. of the weight, while the fibers of linen and cotton are almost pure cellulose.

An atom of cellulose is composed of 12 atoms of carbon, 10 atoms of hydrogen, and 10 of oxygen, $C_{12}H_{10}O_{10}$. If cotton is subjected to the action of nitric acid under certain conditions the acid and the cellulose of the cotton are both decomposed. Nitric acid consists of 1 atom of nitrogen and 5 of oxygen, NO_5; 1 atom of the oxygen of the nitric acid combines with 1 atom of the hydrogen of the cellulose, the remaining NO_4 taking the place of the hydrogen thus removed. Thus 4 atoms of oxygen are carried into the cotton in place of 1 atom of hydrogen. This oxygen is held to the nitrogen with which it is combined by a very feeble affinity, and if exposed to a temperature of 273°, it leaves the nitrogen, and combines with the hydrogen and carbon—burning those substances so suddenly as to cause an explosion.

Oxygen is introduced into gunpowder through the medium of the same agent, nitric acid; but in that case the nitric acid is combined with potash, in the form of nitrate of potash, or saltpetre.

The extent to which hydrogen is displaced by NO_4 in gun-cotton depends upon the manipulation. As prepared for photographic use, there are not enough of the atoms substituted to carry in sufficient oxygen to burn all of the hydrogen and carbon. If photographic gun-cotton is set on fire in a close vessel only a portion of it will be burned. But when treated by Baron von Lenk's process, the German chemists say that 3 atoms of hydrogen are displaced by 3 atoms of NO_4. This would be sufficient to burn all of the hydrogen, and to burn a portion of the carbon into carbonic acid, and the remainder into carbonic oxide.

$C_{12}H_{10}O_{10}+3\ NO_5$ would become $C_{12}H_7O_{10}+3\ NO_4$; 3 HO escaping. On burning this would become $4\ CO_2+7\ CO+7\ HO+3\ N$.

These products are all gaseous at temperatures above 212°, and if cotton was pure cellulose, this form of gun-cotton would burn without leaving any residuum whatever. But as the cotton is not pure cellulose it leaves on burning a small deposit of ash.

Since writing the above we have received a statement of Karoly's analysis of the gases resulting from the combustion of gun-cotton, from which it seems that the theoretical results above stated are almost exactly realized in practice. Karoly gives the following proportions in a hundred parts:—

Nitrogen,	12.7
Carbonic acid,	20.8
Carbonic oxide,	29.
Hydrogen,	3.2
Carbon,	1.8
Water,	25.37
Light carbureted hydrogen,	7.2

PROF. HOFFMAN, of London, has patented a process for making a new coloring matter by means of iodine extracted from sea-weed, and which produces a beautiful violet, blue violet, or red violet. The patented process consists of mixing in certain proportions the substance called rosaniline with the iodides of ethyl-methyl, or amyl. This dye may be used in the same manner as the aniline colors, and is already in the hands of practical people in all the manufacturing districts, and bids fair to be "the color of the season."

MR. JOHN P. SCHENCKL, the inventor of the celebrated Schenckl shell, died recently of consumption at Nuremburg, in Germany, whither he went last summer for the benefit of his health. Mr. Schenckl was for several years a gunsmith in Boston.