

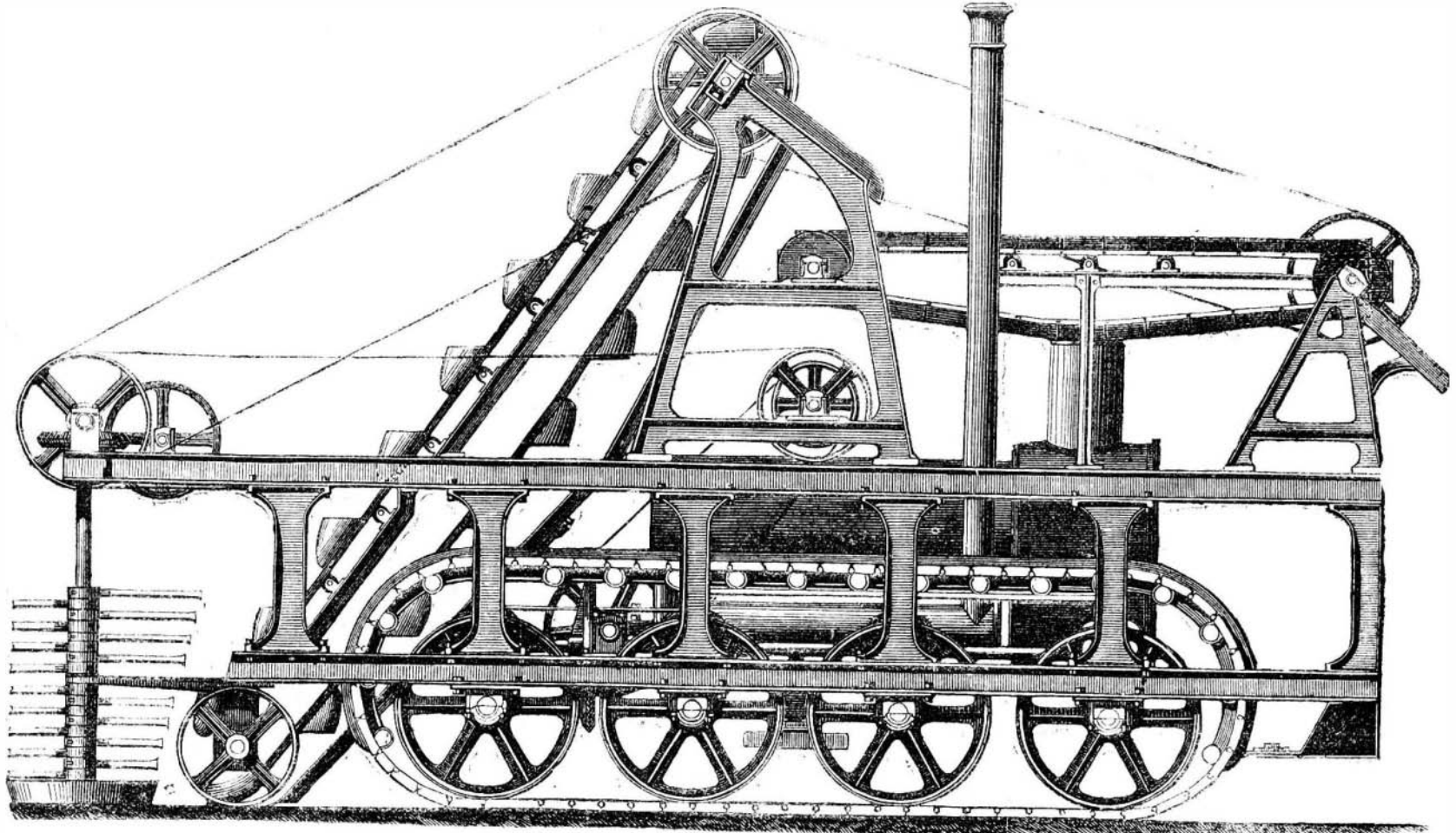
Improved Steam Excavator.
[From The Engineer, London.]

If the question were asked, is it possible to supersede every description of manual labor by the substitution of machinery, the correct answer would be to the effect that there is no doubt about the absolute possibility, but very considerable doubts regarding the expediency of the measure. No people have pushed this principle so far as the Americans—not so much from choice as from sheer necessity—and yet they find that there are some operations which must either continue to be performed by hand, as of old, or not performed at all. The price of labor is one of the most important circumstances

keyed on the shaft of the steam engine which drives another pulley fixed on a horizontal shaft placed in the front of the machine; this shaft carries at each end a bevel pinion, which gears into two bevel wheels fixed on two vertical wrought-iron shafts, around each of which are fixed a certain number of picks or mattocks. These picks are arranged screw-wise, forming about a quarter of a revolution, and turning in opposite directions in such a manner that the picks of one of the shafts fit into the corresponding spaces left between the picks of the other shaft. These picks are in the form of a shovel, and as they dig out the earth horizontally it is thrown back and falls into buckets placed to receive it. Curved sheets of

The Largest Pump Manufactory in the World.

The catalogue of Rumsey & Co., Seneca Falls, N.Y., embraces over 200 different styles and sizes of lift and force pumps. They are now turning out 1500 pumps per week, which range in price from \$3 to \$400, employing 130 hands in the business. John A. Rumsey has recently patented an improved galvanized non-corrosive cast iron pump which is safe from rust. An improved Hand Fire Engine, of great efficiency, is also on their list. The machinery in Rumsey & Co's factory is of the most efficient kind—much of it being of their own invention, and is driven by an unfailing water power. They are now building a new factory, 84 by 43 feet and 4 stories.



VANDEVINNE'S PATENT STEAM EXCAVATOR.

bearing upon this subject, although it is equally affected by other considerations. One thing is certain, that, but for the higher cost or the absence of labor, a great number of present admirable inventions and plans in practice for employing machine *vice* hand labor would never have seen the day. It is not difficult to conceive the application of machinery to purposes of manufacture, and there is a certain amount of fitness in so employing it. But it requires a great stretch of the imaginative faculties to consider it as applied to land. Yet for large tracts of country it is now universally recognized as the only proper agent. Steam plows and steel cultivators are, after a hard fight, overcoming the prejudices and almost hatred entertained towards them by the agricultural population. Farming implements on a less pretentious scale, which have for their object the reduction of the laborers' toil, are now to be seen in and about the premises attached to every farm laying any claim to the epithet "large," and even small ones are provided with pulpers, bruisers, grinders, and other small machines, to an extent our grandfathers little imagined.

Engineers are continually being put in mind of the fact that the surface of the earth and its physical features require a good deal of alteration and modification before they can be rendered subservient to the wants and requirements of this age of progress. Excavating and embanking, or, in other words, the transport of some portion of the earth's surface to some other spot than where nature has placed it, is a perpetually recurring operation in all works of engineering and construction generally. The making up of embankments is simply a work of time; it is in the excavation that the navy has to put forth his bone and muscle; it is by digging that the necessary material for the bank is obtained. We have the highest authority for knowing that in early times digging was, as it is now, the last resource for men who had no other means of gaining a livelihood but by manual labor; it cannot, therefore, be regarded as a very gentlemanly pursuit. Whether M. J. Vandenvinne has been actuated by these considerations we do not know, but he has recently invented and patented a machine for excavating earth which promises to be of great value and practical utility. The accompanying illustration represents it in elevation, and a brief description will render perfectly clear the manner in which it operates. In the first place there is no engine required. A glance at the cut will indicate that it is a steam engine as well as an excavating machine, and combines the motive power and the excavating agent all in one. The whole principle of the apparatus may be explained briefly by stating that the earth is excavated by a double series of horizontal picks rotating in opposite directions, which literally claw away the earth in front of them as the machine advances. It consists of a strong cast-iron frame-work, to the back of which is attached a steam engine for giving a forward or backward motion to the machine, and for driving its working parts. A pulley is

iron are arranged so as to prevent the loose earth from falling at the sides, and impeding the advance of the machine. The buckets are fixed on an endless chain passing over two drums, one at the bottom and the other at the top of the machine; the shaft of the top drum is driven by a band passing over a pulley fixed on the horizontal shaft before mentioned. The buckets are thus in incessant motion, and carry up the earth to the top of the machine, and turn it over on an endless chain which passes over two drums, on the shaft of one of which is fixed a pulley driven by a band from a pulley on the drum shaft of the trough chain. This endless chain carries the earth to the back of the machine, whence it may be carted away.

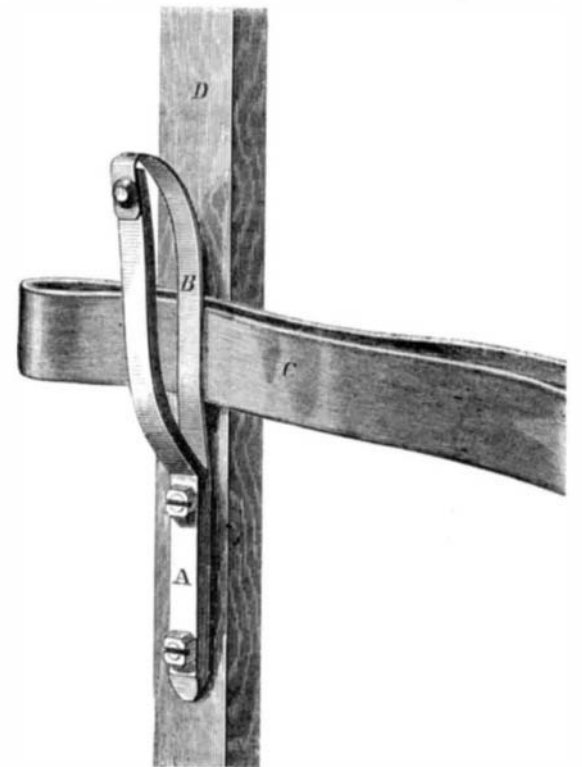
When required the apparatus can be so arranged as to deliver the earth at the side instead of at the back. Friction rollers are placed in suitable supports under the endless chain of the dredge, and also under the endless chain carrying the earth to the back of the machine. At each side of the latter chain, sheets of iron are fixed to prevent the earth from falling off, and two iron sheets, moved by a screw, are placed under the troughs on their descending side to prevent any earth falling into the machine. The forward movement of the machine is effected by means of a pulley fixed on a shaft in the lower part of the framework. The latter shaft drives by means of a wheel and pinion another shaft furnished with a bevel pinion gearing into and driving a bevel wheel fixed on a shaft carrying three endless screws. By these means motion is given to three gearing wheels fixed on the axles of the six wheels or cylinders on which the machine moves upon the endless floor. The machine has besides two other wheels placed towards the front part. A screw jack is adapted to the machine to raise it up when required to make it pivot on itself.

The necessity for enabling a machine of this description to work to any required gradient has been foreseen and provided for, as well as the case of curves, which, in the present day of railway making, approximate closely to what might be termed turning corners. In the engraving is represented a small machine weighing rather more than four tons, and only about three-horse power. We witnessed its performance at the Ashburnham grounds at Chelsea some time ago, when it excavated the ground to a depth of 2½ feet. It broke the earth up small, and threw it into the buckets or hoppers, by which it was conveyed to the rear. One of the large-sized machines, weighing twelve tons, is at work in Belgium, where it is performing in a most satisfactory manner. The speed of the advance can be regulated by the engine at pleasure. From the exceeding neat, clean cut made by this machine it appears to be admirably adapted for the cutting of trenches, for laying gas, water, and other pipes and drains, as there need never be any more earth excavated than what is actually required.

When this is completed they will increase their working force to 250 hands. The business now carried on by this firm was established by Rumsey about 30 years ago.—*Boston Commercial Bulletin.*

ACHENBACH'S REIN HOLDER.

The fastening of the reins is one of the annoyances of horsemen. It is by no means conducive to good nature to return after leaving a horse hitched for a short space, to find the reins which you had endeavored to tie up securely, down under the horses' feet, foul with mud and filth. Yet in the



usual way of fastening, unless special pains are taken, and the flies are less than usually annoying, such unpleasant consequences are almost sure to result. Besides, the knotting of the reins crumples and wrinkles them greatly, injuring their appearance.

Our engraving illustrates a neat little device, which completely removes all the disadvantages we have named.

A is a metallic bracket bolted to the bow, D, of the carriage top, dashboard, or other convenient part of the carriage. From the inside of this bracket rises a spring, B, the upper end of which is turned over and riveted to the upper end of

the bracket so that it cannot catch upon the clothing or injure the hand. When it is desired to secure the reins, C, all that is necessary is to press them down behind the spring, B, as shown in the engraving. It is done in an instant, and the fastening is perfectly secure as the spring holds with great force. The attachment may be made ornamental in appearance.

Patented, through the Scientific American Patent Agency, June 7th, 1870. Address, for further information, John R. Achenbach, Saddle River, N. J.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Immortality of the Soul.

MESSRS. EDITORS:—Upon page 353, current volume, SCIENTIFIC AMERICAN, there appeared an article under the following caption, "A Clever Hoax—Who is Dr. Ivan Slavovski?" Let the doctor be whomsoever he may, there is one thing certain, and that is, the viciousness of his atomic theory of the universe. It is not only vicious, but unthinkable. We cannot imagine an atom so small as to be without an upper and an under side, a right and a left, hence it is impossible for us to conceive an indivisible atom. But I digress. I wish to call your attention to "The Hydropollusis." From the tenor of your remarks, I judged that your faith in that prophecy was somewhat diluted. Now, do you mean to assert that it is only a postulate—a mere figment of the "fine metaphysical mind?" Do you deny that there is a constant and uniform change in the inclination of the earth's axis? If you do not, then there is no alternative—you must indorse the prediction. True, the prediction extends to a very remote, but not an inconceivable future. Geologists have discovered traces of a "Glacial Period," and have revealed the cause; then why may we not predict the effect? Unless I am very much mistaken, there will be an astronomical calculation made public ere long, that will dwarf the above prediction into infinitesimal proportions. I allude to the measurement of the solar orbit. Just think of it, that will be a prophecy all but transcending human comprehension.

Allow me to refer to a prediction made by the poet Longfellow:

A traveler, by the faithful hound,
Half-buried in the snow was found,
Still grasping in his hand of ice
That banner with the strange device
Excelsior!

The traveler is the State of New York, or at least that portion of the State which shall be most elevated six thousand years hence. The faithful hound will be some future Arctic explorer, and that banner with the strange device, nothing less than the ruins of our superior civilization. Don't you believe it? Then you needn't that's all. P. L. B. New York City.

[We do not disbelieve in the change in the inclination of the poles of the earth, as our correspondent seems to think. But we more than believe that the theory of life ascribed to Dr. Meissner, a mythical German professor, the Hydropollusis, and the mathematical demonstration of the immortality of the soul, by the celebrated Dr. Slavovski, were written as clever hoaxes, with a basis of truth at the bottom sufficient to give them an air of reality, and that they went as far and duped as many people as the celebrated Locke moon hoax, which many of our readers will remember. This is what we know. We have little doubt some future generation will get a wetting from the change in the inclination of the earth's orbit referred to, but that the catastrophe will be as extensive as the author of hydropollusis sets forth we have some doubts. [Eds.]

The Universe—Comets—Meteorites.

MESSRS. EDITORS:—Men of science everywhere are busy at work upon the great problems of nature—microscopic and telescopic—material and mental. The following brief suggestions may be useful to those who are engaged in these reconate researches.

The Universe has been well enough defined, "that whose center is everywhere and whose circumference is nowhere." Yet, it is plain that the thing thus defined is an inexplicable mystery; but there can be no doubt of its existence.

The present is eternity; and hence any time, so to speak, (for time is a fiction) in the past has been, and any future period will be precisely in the midst of eternity.

The universe never had a beginning; and, being unlimited in extent, of course it never can cease to exist.

There are as many material organisms in process of formation in the universe to-day as were ever formed during a similar era in the past, or that ever will originate in a like period in the future. And, on the other hand, there are as many organic bodies being destroyed in the universe to-day as at any equal period in the past, or that ever will be destroyed on any day in the future. Organic productions, destructions, and reproductions of every kind throughout the universe follow each other in rapid and unending succession.

The numberless material organisms which constitute the universe—past, present, and future—began, and of necessity must originate in rudiment. This is likewise true of the mind, of the arts and sciences, and of all human knowledge. Everything begins in rudiment.

By means of the foregoing wide generalizations, most of the phenomena of the visible universe may be rationally explained. The earth, for example, had neither an aqueous nor igneous origin, but it is probable that it sprung spontaneously from favorable chaotic molecular conditions—the peculiar nature of which is inscrutable to the human intellect—the

cohesion of its elemental materials being effected by the action of that innate function of matter, called gravity, and thus simultaneously developing the threefold constituents of all organized bodies, namely—matter, principle, and motion. For a long period the inchoate organism gradually developed by molecular accretions, which, being powerfully compacted together in the sphere form and thereby producing heat, at a comparatively early period of its existence, the matter constituting the nucleus or center of the body spontaneously fused; and as the asteroid increased in size, the internal fusion progressed *pari passu*, with only a superficial crust of cold materials upon the surface at any time. In this manner the rudimental earth at length attained maturity, or what may be more properly called its second stage of existence, and in which it became prolific of life—vegetable and animal. The third stage of our planet will be that of its spontaneous combustion, which will transform it into a *sun-star*, and thenceforward it will constitute, either alone or in combination with others, one of the self-luminous bodies in space which do perpetually, but only partially, illuminate the universe. And, finally, after the materials constituting the flaming orb have been greatly reduced by this destructive process, and its illuminating power correspondingly diminished, it will gradually decline till it reaches the fourth and last stage of its existence—that of a comet. In this latter condition, like that of an old man worn and wasted by the weight of long accumulated years till he reaches a sort of second childhood, the star will wander away from its old stellar home, distributing its residuary matter far and wide through the limitless field of black chaotic space, and at last disappear in a gaseous mist!

Hence, it is more than probable that there are now, ever have been, and always will be innumerable rudimental heavenly bodies in the universe. Meteorites, I imagine, are but the fragments of such inchoate organisms, casually broken in pieces by collisions with each other, and scattered through the unending planetary systems revolving in boundless space. Like feeble and tottering infants which are not subject to the laws that govern adults, the children of the universe are not so rigidly controlled by gravity as the older systematized heavenly bodies; and consequently in their erratic motions they sometimes pass between our earth and the sun, and thus produce those dark spots which occasionally appear on the face of the latter body.

The foregoing views, when fully elucidated, will serve to resolve the problems of the universe—as far as they may be comprehended by the mind of man. R. O. D.

Subjects for Investigation.

MESSRS. EDITORS:—We frequently see in scientific works that light and heat are spoken of as "things" *per se*, or, in other words, as entities of themselves.

To one who has for over thirty years held the opinion that light and heat are only conditions of matter, the question, Where does all the heat go? is just as foolish as to ask "Where does the motion go when a train of cars stops?"

When we move our arms, we have motion. When we cease to move it, the motion is non-existent. When we ignite a candle, we have light and heat; blow it out, both cease to exist. We have no knowledge of either apart from matter in a state of combustion or friction, and to treat of them otherwise seems unphilosophical.

We hear and see a good deal about the "Law of Gravitation." Is there such a law? Gravitation is supposed to be a property of matter, and to emanate from it, like an odor or heat, inversely as the square of the distance. What proof can be afforded that such is the fact?

"About the year 1805 it occurred to Sir Richard Phillips that, as the fall of bodies is a mere phenomenon of motion on a moving globe, itself subject to two great motions; so, any variance in the direction of these, would, as in all such cases, produce an increase of velocity in a body surrendered to their free action; and the direction to the center would be likely to be the constant diagonal of both."—[See "Million of Facts."] If you desire it, Sir Richard's proof can be given; of which he says, "No other proof resembles this, in the whole circle of natural philosophy." There are other subjects that more immediately concern us, which might be investigated with profit. For example, several thousands of laborers are without employment in San Francisco, Cal. It is said that "labor is the only legitimate source of wealth." If so, why is it that these people are unemployed? Is wealth so abundant that their labor is not required? Certainly not, for we learn that many of them are in poverty. What then is the cause of this stoppage of production? A. R. Washington, Texas.

Lancaster Beer.

MESSRS. EDITORS:—I send you the result of an analysis of the celebrated Lancaster beer of Pennsylvania, that I have recently made. It is as follows:

| | |
|---|----------|
| Alcohol..... | Parts. |
| Dextrine and gums..... | 3-8000 |
| Sugar { cane, 4998 | 4-3060 |
| { grape, 7840 } Total..... | 1-2538 |
| Free acetic acid..... | 0316 |
| Albuminous matter..... | 0238 |
| Lupuline (bitter principle of hops)..... | 6222 |
| Ash (chiefly phosphates and sulphates)..... | 5992 |
| Total..... | 10-6366 |
| Water..... | 89-3634 |
| | 100-0000 |

I believe this is the first analysis ever made of this beer. I think it may prove interesting to some of your many readers. I have been very much interested in the Notes on Science in your valuable paper. F. G. DU PONT. Wilmington, Del.

Professor Henry of the Smithsonian Institute on Lightning Rods.

In answer to a letter of inquiry as to the best method of erecting and constructing lightning rods, Professor Henry gives the following instructions:

1. The rod should consist of round iron of about one inch in diameter; its parts, throughout the whole length, should be in perfect metallic continuity, by being secured together by coupling ferrules.
2. To secure it from rust the rod should be coated with black paint, itself a good conductor.
3. It should terminate in a single platinum point.
4. The shorter and more direct the course of the rod to the earth the better; bendings should be rounded, and not formed in acute angles.
5. It should be fastened to the building by iron eyes, and may be insulated from these by cylinders of glass (I don't, however, consider the latter of much importance).
6. The rod should be connected with the earth in the most perfect manner possible, and nothing is better for this purpose than to place it in metallic contact with the gas-pipes, or, better, the water-pipes of the city. This connection may be made by a ribbon of copper or iron soldered to the end of the rod at one of its extremities, and wrapped around the pipe at the other. If a connection of this kind is impracticable, the rod should be continued horizontally to the nearest well, and then turned vertically downward until the end enters the water as deep as its lowest level. The horizontal part of the rod may be buried in a stratum of pounded charcoal and ashes. The rod should be placed, in preference, on the west side of the building. A rod of this kind may be put up by an ordinary blacksmith. The rod in question is in accordance with our latest knowledge of all the facts of electricity. Attempted improvements on it are worthless, and, as a general thing, are proposed by those who are but slightly acquainted with the subject.

Photographing on Wood.

Anthony's *Photographic Bulletin* gives the following process by A. J. Searing for photographing on wood for engraving purposes:

"The block on which the picture is to be made is first dampened with water, then whitened with enamel, rubbed from the surface of good enameled visiting cards. Rub gently, removing only the enamel, after which it is brushed smooth with a moderately stiff brush, from right to left and up and down, making a smooth, even, and very thin surface. Allow this to dry, after which it is flowed with a solution of albumen, made with the white of one egg and sixteen ounces of water, dried by heat or allowed to dry spontaneously. Now coat it with another albumen solution made as follows:

FORMULA No. 1.—White of one egg; water, 4 ounces; chloride of ammonia, 40 grains. Beat the whole to a thick froth. Allow to subside, then decant or filter through a fine sponge placed in a glass funnel. Pour a sufficient quantity on one corner of the block to cover it, when spread around with the aid of a 1/2 or 3/4 glass (using the edge). Allow the surplus solution to drain back into the bottle. Dry this by a gentle heat.

FORMULA No. 2.—Ether, 1 ounce; alcohol, 1 ounce; gun cotton, 8 grains; nitrate of silver, 30 grains; dissolved in as small a quantity of water as possible, and allowed to settle for a few days, protected from the light. Flow the salted block with formula No. 2, in the dark room, and dry by gentle heat. It is now ready for exposure under the negative. A porcelain printing-frame, or any other suitable method, may be used to print it. After printing, formula No. 2 is removed from the surface of the block by dissolving in ether and alcohol, assisted by rubbing gently with a soft sponge. The picture can now be toned and fixed in the ordinary way, or fixed and toned at one operation, by the hypo and gold bath. After being allowed to dry, it is ready for the engraver.

The Multiplication of Insects.

A writer in the N. Y. *Evening Post* calls public attention again to this subject, and maintains that it is one of the principal causes of failure in fruit crops. He says so far as our observation extends their number seems to increase with every successive year. They attack the leaves; they attack the fruit, often as soon as it begins to set; they do not spare the branches, or even the trunks. They cause the apple and the pear to become small, knobby, and wormy, or to fall prematurely; they make the fruit of the cherry wormy, and worthless, or cause it to decay on the tree, and prevent the plum from ripening. We have seen medlar trees on Long Island covered with fruit, which was not in a single instance perfected, every medlar being bored through and through by insects, and made apparently as woody as the trunk. Downing's ever-bearing mulberry tree, in the same neighborhood, has its bark pierced in every direction with insects, and unless it is protected from them by some wash impregnated with substances distasteful or fatal to them, the tree perishes. Even the wild red mulberry trees in the wood suffer from the same cause, and die before they come to their full growth.

One of the causes of this extraordinary increase of insects injurious to vegetation is the destruction of the birds that feed upon them. We must take our choice between the insects and the birds. Birds multiply with comparative slowness, and if they prey upon the crops they can be seen and scared away. Insects multiply by myriads, and evade the attempts of man to destroy them. Birds take a small part of the fruit or ripened grain; insects destroy both by wholesale. There is nothing for us to do but to take the birds into partnership, allowing them a part of the annual product on condition of their protecting the remainder, as the traveler in the East pays a tribute to the Bedouin chief on condition of being protected by him from the robberies of his tribe.