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## Portable Drilling Machines.

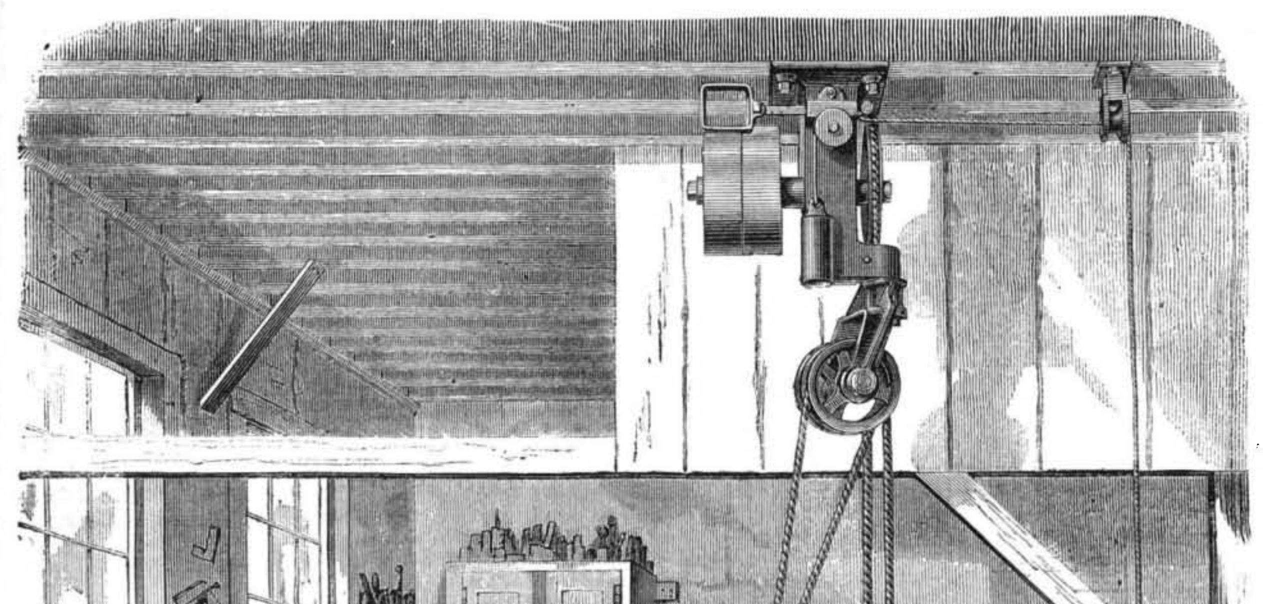
In all machine construction, much time and labor are wasted in drilling holes by hand, for the want of a practical machine driven by power, which would do the work. Our illustration represents three sizes of portable drilling machines, manufactured by Thorne and De Haven, of Philadelphia, which fulfil the conditions required of a tool for this purpose. They can be bolted to the work to be drilled, as easily as a ratchet brace can be rigged up for hand drilling, and can be driven by power in any position, at any distance, and in any direction from the driving apparatus.

Tarred rope is used for transmitting the power, and is found to be preferable in every respect to a round leather belt.

The operation is as follows: The power is transmitted, to the fast and loose pulleys on the countershaft, by means of a flat belt from the line shaft, in the usual way. On the other end of the countershaft is a grooved pulley, which gives motion to the rope which drives the drilling machine. The pulling side of this rope passes under an idler pulley held in a frame which rotates on a hollow stud, through which the rope passes. The rotation of this frame permits the rope to be led in any direction to the drill. A weighted idler is hung on the slack side of the belt, maintaining the tension and permitting the distance of the drilling machine to be varied at will. A weight of only 25 pounds hung there will prevent the rope from slipping on the pulleys when drilling a two and a half inch hole, in the solid, with an ordinary feed. When the rise and fall of this weighted idler does not give sufficient distance, additional lengths of rope can be inserted by means of the couplings used.

All the features of the machine are shown in the engraving. The hight of the post can be altered to suit different lengths of drills and chucks used in the spindle. The radial arm is traveled by a screw and rotated, on the post, by a worm and tangent wheel, giving great accuracy of adjustment and permitting this adjustment without the necessity of removing the rope from the cone pulley. The frame carrying the spindle, gears, and cone pulley can be rotated so as to bring this pulley in line for the rope, in whatever position the machine may be. By removing a collar from the bottom of this frame, as shown in the central figure, the spindle can be set to an angle, with the base of the machine, in any direction. By holding the post in the clamp bearing on the side of the base, the machine will drill parallel to the base.

Both the driving apparatus and the drilling machine have been patented in this country and abroad. Any further information can be had by addressing Thorne & De Haven, 23d and Cherry streets, Philadelphia, Pa., or J. Austin & Co, general agents, 168 Fulton street, New York.



PORTABLE DRILLING MACHINE.

## Bone Dust as a Fertilizer.

The question is often asked whether boiled bones are worth less, and how much less valuable they are, than those containing the grease. Grease is of no value as a fertilizer, and its removal cannot diminish the cash value of the bones. The grease may even lessen their value, in so far as bones containing it are less rapidly decomposed.

There is a great difference in bone dust; the finer it is, the easier it becomes active. According to experiment, steamed and very finely ground bone dust is almost entirely decomposed in a few months, while coarse, raw bone dust has decomposed but slightly in years, so that it is in this respect very like wool and leather. On this account a very fine bone dust has a considerably higher cash value than the coarse.

When to use bone dust depends not only on the plants but also on the soil. Bone dust contains phosphates and nitrogen, both of which are necessary for the growth of all plants; so wherever these are wanting in soil, bone dust can be used to advantage. It is not judicious to employ bone dust or other insoluble organic substances in soils which already contain vegetable remains, as, for instance, in boggy and marshy ground, for we may safely assume that in such soils organic matter decomposes only very slowly, or not at all. In practice, bone dust is used on grain and on dry, not marshy, meadows, and especially on potatoes, since by manuring in the hill a smaller quantity of fertilizer accomplishes a more considerable result.

The method of applying bone dust is either to mix it with other manure, or sow it broadcast on the field and plow it (for grain), or manure in the hill (for potatoes, corn and beets); or it is mixed with sulphuric acid, and the superphosphate thus prepared is used in one of the above mentioned ways.

In making the superphosphate, the bone dust is piled up in a heap, and 30 to 40 pounds of sulphuric acid added to each hundred weight. A hole is made in the top of the pile, and the acid mixed with its weight of water poured in from time to time, and the whole as thoroughly mixed as possible. The heap is then covered with earth and left until it is to be used, or at least for a few days, then mixed with earth and applied.—*Journal of Applied Chemistry.*

## Indium, the Last New Metal.

Indium was first recognized in 1863, by Drs. Reich and Richter, in the zinc blende of Freiberg in Saxony, and by reason of the very characteristic spectrum afforded, which consisted of two bright blue or indigo bands, the brightest of them somewhat more refrangible than the blue line of strontium, and the other of them somewhat less refrangible than the indigo line of potassium. Since its first discovery, indium has been recognized in one or two varieties of wolfram, and as a not unfrequent constituent of zinc ores, and of the metal obtained therefrom, but always in a very minute proportion. Indeed, indium would appear to be an exceedingly rare element, far more rare than its immediate predecessors in period of discovery. Its chief source is metallic zinc—that of Freiberg, smelted from the ore in which indium was first discovered, containing very nearly one half part of indium per 1,000 parts of zinc. A considerable quantity of indium extracted from this zinc was shown in the Paris Exhibition of 1867; and an ingot from the Freiberg Museum, weighing 200 grammes, or over 7 ounces, has within the last few days been kindly forwarded by Dr. Richter himself, for inspection on the present occasion. To Dr. Schuchardt, of Goerlitz, also, the members of the Institution are indebted for his loan of nearly sixty grammes of metallic indium, and of fine specimens of other rare chemical products, prepared with his well known skill, in a state of great purity and beauty.

When zinc containing indium is dissolved, not quite completely, in dilute sulphuric or muriatic acid, the whole of the indium originally present in the zinc is left in the black spongy or flocculent residue of undissolved metal, with which every one who has prepared hydrogen gas by means of zinc and acid is so well acquainted. Besides some zinc, this black residue is found to contain lead, cadmium, iron, and arsenic, less frequently copper and thallium, and in some cases, as that of the Freiberg zinc, a small proportion of indium. From the solution of this residue in nitric acid, the indium is separated by ordinary analytical processes, based chiefly on the precipitability of its sulphide by sulphuretted hydrogen from solutions acidulated only with acetic acid, and on the precipitability of its hydrate both by ammonia and carbonate of barium. From its soluble salts, metallic indium is readily thrown down in the spongy state by means of zinc. The washed sponge of metal is then pressed together between filtering paper, by aid of a screw press, and finally melted under a flux of cyanide of potassium.

Thus obtained, indium is a metal of an almost silver white color, apt to become faintly bismuth tinted. It tarnishes slowly on exposure to air, and thereby acquires very much the appearance of ordinary lead. Like lead, it is compact and seemingly devoid of crystalline structure. Moreover, like lead and thallium, it is exceedingly soft, and readily capable of furnishing wire, by the process of "squirting" or forcing. The specific gravity of indium, or 7·4, is very close to that of tin, or 7·2, and much above that of aluminium, 2·6, and below that of lead, 11·4, and that of thallium, 11·9. In the lowness of its melting point, namely, 176° C., indium occupies an extreme position among the metals permanent in air, the next most fusible of these metals, namely, tin and cadmium, melting at 228°; bismuth at 264°; thallium at 294°; and lead at 235°. Though so readily fusible, indium is not an especially volatile metal. It is appreciably less volatile than the zinc in which it occurs, and far less volatile than cadmium. Heated as far as practicable in a glass tube, it is incapable of being raised to a temperature sufficiently high to allow of its being vaporized, even in a current of hydrogen.

Indium resists oxidation up to a temperature somewhat beyond its melting point, but at much higher temperature it oxidizes freely; and at a red heat, it takes fire in the air, burning with a characteristic blue flame and abundant brownish smoke. It is readily attacked by nitric acid, and by strong sulphuric and muriatic acids. In diluted sulphuric and muriatic acids, however, it dissolves but slowly, with evolution of hydrogen. Oxide of indium is a pale yellow powder, becoming darker when heated, and dissolving in acids with evolution of heat. The hydrated oxide is thrown down from indium solutions by ammonia, as a white, gelatinous, alumina-like precipitate, drying up into a horny mass. The sulphide is thrown down by sulphuretted hydrogen as an orange yellow precipitate, insoluble in acetic but soluble in mineral acids. The hydrate and sulphide of indium, in their relations to fixed alkali solutions more particularly, seem to manifest a feebly marked acidulous character. Chloride of indium, obtained by combustion of the metal in chlorine gas, occurs as a white micaceous sublimate, and is volatile at a red heat, without previous fusion. The chloride itself undergoes decomposition when heated in free air, and the solution of the chloride does so upon brisk evaporation, with formation in both cases of an oxichloride.

But the chief point of chemical interest with regard to any newly discovered element, and consequently with regard to indium, is the establishment of its atomic weight; which, in the case of a metallic element, is based primarily upon the determination of the ratio in which it combines with oxygen and chlorine. In $Cl_3$, the atomic weight of indium is 113·5.—*Lecture by Professor Odling, in Mechanics' Magazine.*

### The Eye.

There is no optical instrument maker who does not succeed in constructing an apparatus much more perfect in many points than the eye—that marvellous organ, which we are inclined to regard as the masterpiece of vital and organic architecture, on account of the great service it renders to man.

This sense of sight, which is so far reaching that it gives us the power to penetrate infinite space and apprehend the universe, at the same time makes us familiar with the minutest objects: this sense, which is the freest and most uncircumscribed in its actions—for our sense of touch is limited by the length of our arms, hearing to a few thousand feet, the senses of smell and taste having still greater limitations—this sense, I say, acts through an agent apparently so imperfectly adapted to its purpose, that recent investigations stand amazed at the idea how by it we receive any intelligible impressions. That we do is an evidence of the independence of the mind, and its power to make useful these necessary and imperfect means contact with the outer world, and proves the necessity of educating this sense to quick and precise perceptions in order to correct its faults and perfect the work which Nature has designedly left imperfect.

The eye has the defect of what in physics is called the "aberration of sphericity:" that is, the rays that pass through the center of a lens have a common focus, but rays which pass a certain distance from the center do not converge at the same point, but pass beyond. The nearer they come to the circumference, the greater the focal distance, if the lens is rigorously spherical. In good optical instruments, this defect is scarcely perceptible, the rays being centralized by flattening the lens. Again, the eye is not spherical, but has an elliptical curve. This was for some time thought to be an advantage, but the contrary is the truth. And this curve is not even well "centered," that is, placed symmetrically to the visual axis like a lens, but is changed and twisted in every direction. From this results what has been called the "astigmatism" of the eye, which consists in not being able to see at the same distance a vertical line with the same distinctness as one that is horizontal. This recently discovered phenomenon has attracted the attention of all oculists, as it sometimes constitutes a real disease of the eye. Again, the retina of the eye has spots where it is entirely blind to impressions of light. But is this eye, which is unsymmetrical, badly centered, blind in spots, at least perfectly translucid? Not at all. The cornea and crystaline lens of the eye are are not absolutely limpid, as appears when examined through an intense blue or violet light, which renders it fluorescent. This phenomenon is due to the traces of a substance analogous to quinine, a body which possesses in the highest degree the property of fluorescence, that is, of emitting a light of its own, under the excitement of blue or violet lights. The crystaline lens, itself, is not of a homogeneous composition, but has a crystaline structure of six branches. This is the cause of the stars appearing to us with rays. All attempts to explain this phenomenon were vain, until it was found to be in the visual organ itself. It is for this reason that the crescent of the moon, when it is very thin, seems to be double or triple to some persons.

These facts are enough to show to any one how prone the untrained eye must be to error and self deception, and that seeing is not a physical but a mental act. In infancy, the eye is aided by the hands or touch to acquire experience of the nature and consistency of things; later in life, the eye asserts its superiority by instructing the hands to perform ingenious and cunning work. The two senses seem thus to continue mutually to assist and act upon each other. Touch lends to sight material aid and support. The eye refines and gives intelligence to the material sense of touch, so that, when sight is wanting, touch takes its place and performs its duties.

The eye in its direct and steady look embraces but a small compass of actual sight; in fact, we clearly see but a small point, which comes just in the focus of the eye; and it is owing to a quick vibratory movement of the eye that we are able to see large extents apparently at the same time.—*Professor John H. Niemeyer.*

### PATENT INFRINGEMENT CASES.

*United States Circuit Court—Southern District of New York.*

Rubber Tip Pencil Company *vs.* S. D. Hovey *et al.*

This was a suit in equity brought for an alleged infringement of the patent granted to J. B. Blair, July 23, 1867, for rubber heads for pencils. The nature of the patent and the facts are fully set forth in the opinion of the court.

Benedict, Judge:

This action is founded upon a patent for rubber heads for lead pencils, issued to J. B. Blair, dated July 23, 1867, and numbered 66,938. The novelty of the invention and the validity of the patent are put in issue.

The proper construction of the patent is the question first presented. The description, as given in the specification and claim, is as follows: The specification states the invention to be a new and useful cap or rubber head to be applied to lead pencils for the purpose of rubbing out pencil marks. It then describes it as follows: "The nature of the invention is to be found in a new and useful improved rubber or erasive head for lead pencils, and consists in making the same head of any convenient external form, and forming a socket longitudinally in the same to receive one end of a lead pencil or a tenon extending from it. * * * * The said head may have a flat top surface, or its top may be of a semicircular or conical shape, or any other that may be desirable. Within one end of the same head, I form a cylindrical or other proper shaped cavity. This socket I usually make about two thirds through the head and axially thereof; but, if desirable, the socket or bore may extend entirely through the said head. The diameter of the socket should be a very little smaller than that of the pencil to be inserted in it. The elastic erasive head so made is to fit upon a lead pencil at or near one end thereof, and to be made so as to surround the part on which it is to be placed, and to be held thereon by the inherent elasticity of the material of which the head is to be composed."

"The head is to be composed of india rubber, or india rubber and some other material which will increase the erasive properties, such as powdered emery for instance."

The article is further described by drawings, which, the specification states, "exhibit the elastic head so made as to cover the end as well as to extend around the cylindrical sides of the pencil; but it is evident that the contour of the said head may be varied to suit the fancy or taste of an artist or other person, and I do not limit my invention to the precise forms shown in the drawings, as it may have such or any other convenient for the purpose, so long as it is made so as to encompass the pencil and present any erasive surface about the sides of the same." The specification further states that the elastic or rubber pencil head, made as above set forth, may be applied not only to lead pencils, but to ink erasers and other articles of like character.

The claim is for "an elastic erasive pencil head made substantially in manner as described." In considering the effect of this language, it is to be noticed that the invention is not stated to be a combination, but a single article of manufacture—namely, an elastic erasive pencil head. The peculiarity in this article, by reason of which the inventor supposes himself entitled to secure it as his own, is not stated to consist in its elasticity; that is a quality of the material to be used, which is india rubber. Nor does it consist in erasive capacity; that, also, is solely due to the material out of which the article is manufactured.

An effort has been made to show that the erasive capacity of the Blair head is increased by means of certain swells or projections on the sides of the head, which are portrayed in the drawings and supposed to be indicated in the specification as a feature of the invention claimed; but I find no language which can fairly be said to convey the idea that such swells or projections form a part of this invention. On the contrary, the description states that the heads may be of any convenient external form, and expressly declares that the invention is not limited to the precise forms shown in the drawings, but may have any convenient form "so long as it is made to encompass the pencil and present an erasive surface about the sides of the same." The phrase last quoted from the specification discloses what is the real and only feature of the article in question upon which the right to it is based; and the characteristic is one of form, but not of what is called in the specification external form.

The characteristic form which the inventor claims to have invented is, broadly, any form which will enable the rubber to encompass a pencil, ink eraser, or other article of like character. The additional words "and present an erasive surface about the sides of the same" add nothing to the description, as it is impossible to have a piece of rubber encompass a pencil, ink eraser, or other article of similar character without presenting an erasive surface about the sides of the same. From this form which the inventor gives to a piece of rubber—otherwise to be of any convenient form—and from this form alone, does the article derive its value, as distinguished from rubber in any other form. By means of this form, any person is enabled easily to attach the rubber to a pencil, ink eraser, or other article of similar character, and the only useful result attained by the invention in question is that the head can be so easily attached to any pencil.

Now, what is it that accomplishes the useful result attained by the Blair pencil head? Simply the hole made in the rubber. There must be a piece of rubber with a cavity in it to constitute such a pencil head as Blair's specification describes, and there need be nothing more. The cavity may be round, square, or any other shape. It may go through or partly through the piece of rubber, and it may be of all sizes. The article sought to be secured by this patent, briefly and yet, as I think, fully described, consists, therefore, of a piece of india rubber with a hole in it. I am unable to fix any other limitation to the invention by any fair use of the language employed in the specification and claim.

Such an article cannot be the subject of a patent. The elastic and erasive properties of india rubber were known to all, and gave to that substance the names by which it is generally designated; and how to make a piece of rubber encompass and adhere to another article was known to every person who had ever seen a rubber shoe. No person knowing of the elastic quality of rubber could be wanting in the knowledge that a piece of rubber could be made to encompass and adhere to a pencil, ink eraser, or other article of similar character, by making a hole in it; nor could any one be deficient in the skill requisite to make such a hole.

I am of the opinion, therefore, that the patent in question cannot be upheld for want of invention.

This conviction, which I am unable to escape, renders it unnecessary for me to express any opinion upon the questions of abandonment so largely discussed at the hearing, nor to determine whether the patent in question is for the same invention described by Joshua Gray in his application for a patent, and by others who have been relied on by the defence as showing prior invention.

A decree must be entered, dismissing the bill with costs.

*United States Circuit Court—Northern District of New York.*—Jacob E. Buerk *vs.* Dennis Valentine.

This was a suit in equity on two patents for watchmen's time detectors. Judge Woodruff decides that both complainant's patents are valid, and that both were infringed by defendant, who imported time detectors and sold them in this country. The patented improvements (sometimes called by the trade watch clocks and watch control), are largely used in factories and public buildings, and enable the officers to have a check on the watchman. The watchman carries the detector with him in his circuit to the rooms to be visited, and inserts a marking key fastened in the room, so as to mark a paper dial secured inside the detector. This is done at every room and station visited, a peculiar key being fastened at each place for that purpose. An inspection of the paper dial, at any time afterwards, will reveal the time and order of the visits.

Decree awarding an injunction and account, as prayed in the bill.

### Insect Wax of China.

In China, prior to the thirteenth century, beeswax was employed as a coating for candles; but about that period the white wax insect was discovered, since which time that article has been wholly superseded by the more costly but incomparably superior product of this insect. The animal feeds on an evergreen shrub or tree (*Ligustrum Unidum*) which is found throughout Central China, from the Pacific to Thibet.

Sometimes the husbandman finds a tree which the insects themselves have reached, but the usual practice is to stock them, which is effected in spring with the nests of the insect. These are about the size of a fowl's head, and are removed by cutting off a portion of the branch by which they are attached, leaving an inch each side of the nest. The sticks with the adhering nests are soaked in unhusked rice water for a quarter of an hour, when they may be separated. When the weather is damp or cool, they may be preserved for a week; but, if warm, they are to be tied to the branches of the tree to be stocked without delay, being first folded between leaves. By some, the nests are probed out of their seats in the bark of the tree without removing the branches. At this period they are particularly exposed to the attacks of birds, and require watching.

In a few days after being tied to the tree, the nests swell, and innumerable white insects the size of nits emerge and spread themselves on the branches of the tree, but soon with one accord descend towards the ground, where, if they find any grass, they take up their quarters. To prevent this, the ground beneath it is kept bare, care being taken also that their implacable enemies, the ants, have no access to the tree. Finding no congenial resting place below, they reascend and fix themselves to the lower surface of the leaves, where they remain several days, when they repair to the branches, perforating the bark to feed on the fluid within. From nits, they attain the size of lice; and having compared it to this, the most familiar to them of all insects, our Chinese authors deem further description superfluous. Early in June, they give to the trees the appearance of hoar frost, being changed into wax. Soon after this, they are scraped off, being previously sprinkled with water. If the gathering be deferred till August, they adhere too firmly to be easily removed. Those which are suffered to remain to stock trees the ensuing year secrete a purplish envelope about the last of August, which at first is no larger than a grain of rice; but, as incubation proceeds, it expands and becomes as large as a fowl's head, when the nests are transferred, in Spring, to other trees, one or more of each, according to their size and vigor, in the manner already described. In being scraped from the trees, the crude material is freed from its impurities, probably the skeletons of the insects, by spreading it on a strainer, covering a cylindrical vessel, which is placed in a cauldron of boiling water; the wax is retained in the former vessel, and, on congealing, is ready for market. The *pel-lah* or white wax, in its chemical properties, is analogous to purified beeswax and also spermaceti, but differing from both, being in my opinion an article perfectly *sui generis*. It is perfectly white, translucent, shining, not unctuous to the touch, inodorous, insipid, crumbles into a dry, inadhesive powder between the teeth, with a fibrous texture resembling felspar; melts at 100° Fahr.; insoluble in water; dissolves