TERRIBLE GUN COTTON EXPLOSION AT STOWMARKET, ENGLAND.

The wholesale destruction of life and property by explosive agents which characterizes the present time, may well lead to the inquiry whether this sacrifice is demanded by the exigencies of modern civilization. Steam, gunpowder, nitroglycerin, dynamite, gun cotton, lithofracteur, these are the powerful genii invention has summoned to obey human will. But they are latterly showing that they can disobey, and take every opportunity to disobey, unless constantly guarded by the most rigid surveillance. Some of these, indeed, have a habit of going off without any apparent neglect on the part of those who use them. What a chapter of horrors the last two years has furnished! and now from England comes another which has not only destroyed many lives and much property, but has taught that we really know little of the nature of explosions, since one of the explosions occurred in a manner supposed to have been proved impossible by a long series of Government experiments. From *Engineering* we gather the following facts:

A most lamentable explosion occurred at Stowmarket, England, on Friday, August 11. The works of the gun cotton manufacturing company, in which Messrs. Prentice are the principal partners, are situated on a stretch of meadows about three quarters of a mile from the town of Stowmarket, in a northeasterly direction. On this strip of land were the mixing or dipping, and the drying sheds, in which the cotton is passed through the chemical solutions and dried. At the southeastern end of the grounds stood three magazines, about 12 feet long, 10 feet deep, and 8 feet high. The sides were constructed of wood, lined with canvas and paper on the interior, and the roofs were lightly covered in with slate. The magazines were built on wooden piles, and were placed 14 feet from each other, and between them were 9 inch brick walls rising higher than their roofs. They had neither windows nor skylights, the only openings being the single door in each. They were used to store the finished gun cotton until sent away from the works. At the time of the explosion each magazine contained about five tuns of thematerial, part of an order which was being executed for the English Government. At the northeastern end of the works, and about 900 feet from the three magazines, is a building similar in character to them, used as a store for rifle cartridges. About 130 hands, men, women, and children, are employed in the establishment, and they had just resumed work after the dinner hour, when a fearful explosion occurred on the site of the three magazines to which we have alluded. To those on the works who are able to give any account of the occurrence, there appeared to be but one explosion, while in the town of Stowmarket, three distinct explosions were heard to follow each other in very rapid succession. The work people rushed from the tottering sheds around, only to be killed or injured by the falling *débris*.

Soon after the explosion, Mr. E. H. Prentice, one of the directors, and who is the manager of some neighboring chemical works, and Mr. W. R. Prentice, second son of Mr. Manning Prentice, were on the spot. They proceeded to collect the workmen, and with them set to work to save such of the buildings as still remained, but which had taken fire. Relying on the results of some experiments which had been carried out to prove the gun cotton, as now manufactured, to be non-explosive except by percussive fire, Mr. E. Prentice was engaged in removing boxes of cartridges from the flames, being assisted by his nephew. Although warned of danger, he still continued his fatal work, when one of the boxes exploded. This explosion completed the fearful work of destruction, and the remainder of the works was rendered an easy prey to the flames. The latest accounts place the number of persons killed by the disaster at 24, the number of wounded being 72, and it is possible that some names in the latter may go to swell the former list.

[For the Scientific American.]

THE SURF.

BY CHARLES MORRIS, OF PHILADELPHIA.

How many of the great army of pleasure seekers who have this summer wandered upon the sea beach, have seen any mystery in the breaking of the surf, or questioned the origin and character of the mighty force there displayed? Probably not one in a thousand has considered the subject worthy a thought, and not one in ten thousand has understood it. Of course, all have a general idea that the surf originates in the dashing of the wave upon the beach. But a wave is a simple elevation and depression of the surface of the water, without any permanent forward movement; the surf, on the contrary, is a permanent forward movement. The question arises, how the one condition is changed into the other.

The seeming forward motion in the waves is simply the progressive motion of the force that produces them. This force exerts itself on successive portions of the water, one rising as the other sinks to rest. Each particle of the water, after describing a vibratory or circling path under the impulse of this force, comes to rest at the center of its motion while the force, traveling onward, disturbs new particles. Thus the quantity of force remains permanent, while the locality constantly changes.

This force tends to produce motion in all directions, and moves forward from the fact that a continuation of the wave motion resists its backward movement. It has also an effect on the water below the surface, acting downward until the accumulated resistance balances the motive force: the effect of this resistance being aided by the greater facility of surface propagation.

It is this downward influence of the wave force to which the phenomenon of the surf is due. The wave, traveling shoreward, in time reaches water so shallow that the downward impulse of the force extends to the bottom. Thus the elastic resistance of water is exchanged for the rigid resistance of the solid bottom, and the force is reflected upward. It is this elastic reaction that lifts the water, the wave being prevented from having its full extension downward. As the water grows shallower this effect increases, so that the waves rapidly increase in hight.

But now the bottom of the wave is dragging, as it were, upon the sand. Thus a frictional resistance hinders the ready communication of force from particle to particle at the bottom, and the onward motion of the wave force is delayed. This resistance of friction has little or no effect on the surface particles, its influence continually decreasing upward. Hence the wave force is now moving onward more rapidly at the surface than at the bottom. The wave, in consequence, slants forward, eventually toppling over from the force of gravitation.

Now the motive force of the wave, which has hitherto been communicating itself regularly from particle to particle of the water, is prevented from doing so by this disturbance of the regular vibratory motion. It, therefore, acts with its full progressive vigor on the portion of water last affected, driving it bodily forward, until the force is balanced by the counter effects of gravitation and friction. The wave force thus eventually becomes changed into the heat of friction, or is partly employed in abrasion of the sands, and partly in producing the potential energy of lifted water.

The surf, where the wave breaks upon a bar, is similarly caused. But the water which is dashed forward by the propelling force, meeting deep water within, experiences an elastic resistance to its forward motion. It is thus brought to rest, and its movement communicated to the water in advance. Thus a continuous communication from particle to particle recommences, and the wave is reformed. Of course, the friction upon the bar employs a portion of the force, the quantity of which lost force depends upon the shallowness of the water. Hence the wave is always lower inside the bar.

In case the surface of the bar reaches very near the surface of the water, the friction uses up nearly all the propelling force of the wave, and the water within is nearly or quite smooth.

What an immense force is thus, day after day, and century after century, expended as friction upon the sea beaches of the world, employed in grinding solid rock into the huge accumulations of sand found every where throughout the earth!

The Effect of Sun on the London Asphalt Roads.

Should we be favoured with a continuance, or an accession in intensity of the summer heat, the watering cart or hose will be as necessary appendages for maintaining the solidity of our new roadways as they are in laying the dust on our old ones. A plastic asphalt surface is in no wise desiderated or coveted for vehicular traffic, and it would be an unfortunate event if, after all the cost, obstruction, and delay that have attended the introduction of our latest, and still most useful road material, to find it fail in the most useful essentials, namely, the retention of its hardness and body, under all conditions of the atmosphere. After all, the hot weather may not have come in vain, if it gives us a good and timely opportunity to benefit by its occurrence, in the improvement of our road construction, and in the better selection and manipulation of the present and similar material for the future. Experience teaches, it is said; but the right of way is often blocked by vested interests, which neither shower nor sunshine has been found to materially affect. In the present instance perhaps the power of the sun will turn men's minds nearer to a conviction of the truth than the power of the pen, and those who more immediately interested will improve and profit accordingly. We need scarcely say that our remarks are not made in disparagement of the asphalt pavement, but as a hint to further practical efforts for the direction of improvement.—*Builder*.

Manufacture of Telegraph Cables.

Mr. Henley's works at North Woolwich, Eng., cover fourteen acres in extent, employ at present only 1,100 to 1,200 hands—being rather slack—2,000 being the normal number, and can turn out at present some 100 miles of cable weekly, with prospective power of increasing that quantity to 250 miles; it thus will be seen that this is a factory of no ordinary kind or magnitude. In the core there are six copper wires stranded around a central one, making seven in all. These are tinned over, and completely sheathed with an insulating covering, varying in material and thickness, either simple or compound; in the former case being composed entirely of gutta percha in a solid mass, in the latter, of felted tape wound round the wire in two bands in opposite directions, and finally encased under compression by rollers, with a thin seamless sheathing of india rubber (or similar material). Of the two, the latter is by far the most perfect insulator or mode of insulation, whereas the former has hitherto had the preference, from considerations of cost; but now it is believed that the superior material, india rubber, can be brought into successful competition with its cheaper and inferior rival, even from a financial point of view. The core so prepared in either way, has then spun around it two successive yarn sheathings, in numerous strands, varying according to the purpose in view, which supply a bed for the true cable, in point of strength, as contrasted with the electric cable element, the core. Round the whole are spun or twisted stout galvanized iron wire strands, also of varying number and size, as may be required, over which again are wound, in opposite directions, two fine strands of jute yarn, firstly with a resinous compound containing silica, and ultimately with a seething tarry compound, cooled and hardened, by a stream of water, in the gripe of a set of roller wheels, compressing and finishing off the whole. Whence issuing, the cable is coiled within the tanks, in successive rings and layers. The method of applying the asphalt coating by means of bucket wheels or turbines, in reverse operation, is most ingenious, effective, and noteworthy.

The description applies to the formation of a single cable, as well as to a multiple cable, with this difference, that in the latter case several of the insulated cores of stranded tinned copper wire are twisted in combination with other strands of yarn into a compound core, which then receives the outside sheathings of yarn and galvanized iron wire.

A remarkable feature about these telegraph works is that they are almost entirely self contained, so that nothing is required beyond the raw materials worked up in the manufacture, the metals, iron, copper, and zinc, the acids and chemicals, the jute yarn, and the insulating substances. The drawing of the wire, the annealing, acid cleansing, galvanizing and drying thereof; the stranding of the core; the preparation and completion of the insulating sheaths—every initial intermediate, and ultimate stage is conducted and carried on, every process provided for and executed; and all the machinery for the purposes, and even much of the very buildings which cover and contain the work, is manufactured and put together on the premises excepting prime movers.

The motive power is mainly obtained from duplicate 75 horse power horizontal steam engines, of the ordinary type with some special features.

Improved Miter Box.

Mr. George E. Hedges, of Ashland, Nebraska, has invented an adjustable miter box, designed to improve the means for maintaining miter saws in their true position. A bed plate sustains a semicircular platform on which the piece to be sawn is laid. A flange on the straight side of the platform, forms an angle for the piece to rest in, as that of all miter boxes. This plate or platform is pivoted at the center of the circle to the bed plate. The box turns on this pivot, and may be secured on the bed in any desired position, so as to saw a piece of wood at a true miter or any other angle. The saw line passes at a right angle across the bed and directly through the central pivot. There are two uprights at each end of the saw line, connected together at top and bottom, but in such a manner that one of each pair is adjustable toward or from the other, so that the saw guides may be made to suit saws of different thicknesses. These guides are connected together at their top ends, and are attached to the uprights so as to slide up and down and govern the saw. A saw back is attached, between the guides at their upper ends, to the saw by a set screw, and supported in position by two arms, of which the first receives the saw near the handle, and the second is adjustable on the back. The saw and back being thus attached, the teeth are thrown below the guides to prevent injurious contact with the metal. The upright posts and guides are made of metal, and are consequently not liable to get out order like miter boxes made of wood. The guides with the saw back are suspended from the top of the uprights by light springs, but so that while their weight will be supported, the saw will work down into the wood with but slight pressure. We regard this as an excellent invention simple and practical.

Ripping Tool.

This invention relates to a new and useful tool for ripping seams sewn in cloth and for other purposes. This tool is a small flat instrument, of steel or suitable material, with a wide notch in one end, in which a oblique knife edged cutter and a clearance for the shreds are formed on the bottom of the notch, while prongs or projections at the sides of the notch form guides for keeping the seam to be ripped on the knife edge, each guide being different from the other, and adapted for a seam differing in some respects from what the other is adapted to. The handle or stock of the instrument is provided with a notch adapted for use as a wrench; also a hook and a niche, whereby the said implement is adapted for several uses in connection with sewing machines; the object of the invention being to provide a simple and efficient implement which will act by a shear cut, instead of the direct jam cut common to other ripping tools, in which the cutting edge is presented perpendicular, or nearly so, to the seam; and also to adjust the seam or cause it to assume the proper relation with the cutter as it is brought to the cutting edge. This handy little instrument is the invention of Justus O Woods, of New York City.

HAND TURNING.—The Company of Turners, in London, purpose to establish an annual prize for technical skill. The prize will be in the form of the company's silver medal and and the freedom of the company and of the City of London, and will be given for the best specimen of hand turning in the yeor. This year the competition will be in turning in wood. It is provided that the specimens shall be delivered at the Mansion House in the first week of October, and that they should not exceed 18 inches in hight and 1 foot in diameter.

PROPOSED TEST FOR STEEL AND IRON.—Mr. H. A. Walker, of Tarboro', N. C., proposes that the scintillation of iron and steel filings, when put in a fire, be made use of to test the quality of the metal. The different degrees of brilliancy, as well as the readiness with which the filings sparkle in the fire, are suggested by Mr. Walker as proofs of the varying purity of the iron or other metal. The test is handy and convenient, and might be of some practical value.

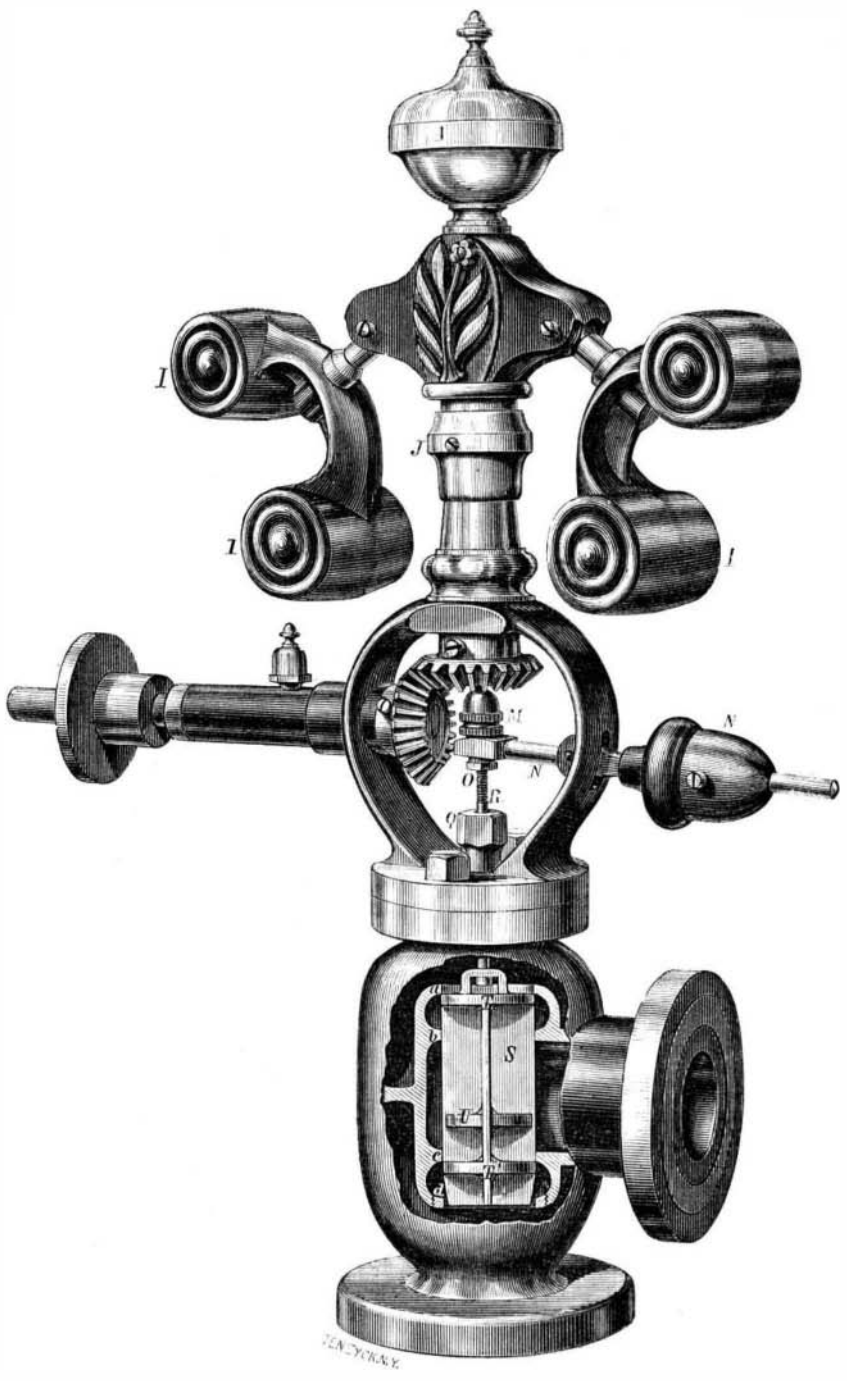
Patent Safety Steam Governor.

The one prime necessity in a manufactory using steam power is a good governor on the engine; a desideratum which the experience of every one, who has used steam any length of time, proves, has not been easy to obtain. The main difficulty has been that governors were not sensitive enough to the changes of load on the engine to prevent too much change of speed. Cotton and woolen mills, and flour, paper, and saw mills are especially troubled in this particular, as each makes large changes in the load suddenly, and each needs the most regular speed. The engraving herewith illustrates a governor, called by the inventor the "Acme," which would seem to meet all these requirements and difficulties, beside being a safety governor, as, in case of breakage or throwing off the governor belt, no "runaway" can occur.

Two difficulties have been found to exist in governors, both or either of which would prevent proper speed. The first was the construction of the upper or governing works, so that in motion they were bound, or else would work quicker one way than the other, cutting off steam quicker than letting it on, or *vice versâ*, when needed, thereby causing the engine to jerk and run much above and below its regular speed at each change of load. The second cause was that when steam was passing through the governor, the valve (although theoretically balanced) was forced out of balance, thus causing a variation of speed corresponding to the unavoidable changes of pressure of steam, and also continual antagonism between the valve and the governing works.

Referring to the engraving, the novel construction of the revolving weights, I, is designed to produce a quick response to any change of speed,—the theory of the inventor being that the lower part hangs in the proper position—nearest under center of suspension possible—to swing outward the most readily should the load be thrown off; and the upper part is in the best position—nearly on a parallel line with center of suspension—to exert all its weight downward, instantly, in case of slackening speed. It may seem that the power required to raise the upper part of weight, I, would balance its usefulness; but it is claimed that the power required to raise the weights when in motion is small, and of course gravitation compels them to act with their whole weight when required. In the brass case, A, is a volute spring, which is compressed by a thumb nut attached to the valve rod, tightening or loosening of which alters the speed of the engine. But the main object is a valve, balanced under all circumstances. S is a four winged valve, having two regulating disks, T and T', and a smaller balancing disk, U. The valve case has four ledges, *a, b, c, d*. When in operation T and T' are nearest *b* and *d* respectively. Steam passes up under T, and over and under T'. The action of the steam on T is to force it upwards; on T' to draw it downwards, a little more than overcoming the upward strain on T; to meet which, the smaller disk, U, is placed so that the steam acts between it and ledge, *c*, just enough to balance the difference between the regulating disks, as described, so that no matter how much or little steam is passing, or what the pressure is, the valve is always balanced, and the upper works have only to overcome the friction of the packing at Q, in raising or depressing the valve, the weight, N, just balancing the weight of valve, and used for no other purpose.

If the governor is stopped by disarrangement of belt or otherwise, the disks, T and T', are drawn up, as seen in the engraving, and the steam is throttled at ledges, *a* and *c*. This governor was patented October 11, 1870, and February 21, and August 8, 1871, by J. D. Lynde, 405 N. 8th Street, Philadelphia, Pa., where he can be addressed for further information. We are informed it will also be on exhibition at the Fair of the American Institute in this city, during this and next month.



LYNDE'S PATENT STEAM GOVERNOR.

Implement for Stretching Shoes.

Dr. Dio Lewis says: "Within three blocks of my Boston residence there are eleven corn doctors. Some of them employ a number of operators, and do an immense business. A large majority of adults, among the better classes, suffer from corns, or other maladies of the feet."

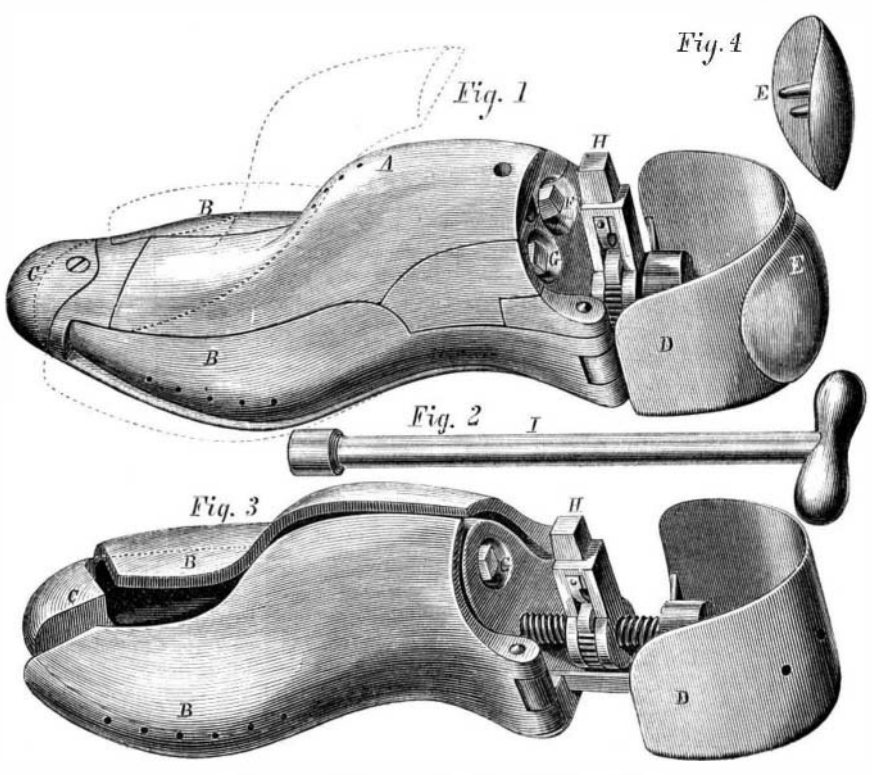
The inventor of the instrument illustrated herewith, Dr. E. R. Bardin, is a practicing surgeon and physician at Newburgh, N. Y. Having had his attention strongly called to the numerous diseases of the feet resulting from the irrational style of foot gear now in vogue, and finding great difficulty in getting shoemakers to make boots and shoes according to the necessities of individual cases, and also difficulty in getting patients to wear properly shaped shoes, he was led to invent some means whereby boots and shoes may be efficiently stretched so as to relieve diseased feet.

The stretcher shown in the engraving is the ingenious and scientifically constructed device resulting from his study of the subject.

The general principle of the invention is that in order to stretch any one part of a boot or shoe effectively, all the slack leather in the upper must be first stretched, so that it will not, by its yielding, defeat the stretching at the exact point it is desired to enlarge. The operation of the stretcher is, therefore, first to draw all the leather tight, and afterwards to stretch the particular portion which is too tight to the foot.

Fig. 1 represents the instrument as constructed for men's boots. It consists of pieces A, B, C, D, and E, all formed of nickel-plated cast iron, and connected with sole piece and system of levers, links, and inclines in the interior, not shown.

The piece, E, is only used when it is necessary to enlarge the heel to relieve a tenderness which often results from too stiff counters.



DR. BARDIN'S SHOE STRETCHER.

The holes represented in B are for the attachment of leather bunches, by pegs, in order to enlarge portions over tender corns, bunions, etc.

The key, I, is used to operate the instrument, being applied at either T, G, or H, and producing the following effects:

In stretching the boot lengthwise after the stretcher is inserted, the key is applied at H. It is then oscillated from side to side, which actuates a ratchet and screw, and separates the toe piece, C, and the heel piece, D, till all the longitudinal slack is taken up.

The key is next applied to F, and turned about like an ordinary bed wrench. This actuates mechanism by which the instep piece, A, is elevated, and the slack leather taken up in that direction. Applying the screw to G, and turning it in a similar manner, the side pieces, B, are forced apart. The order of moving and extent to which these pieces are thus moved is varied according to the effect desired.

Fig. 3 is the form of the instrument employed for ladies' boots which open upon the instep or at the side of the ankle. In this form, the instep piece is omitted, and the side pieces enlarged to fill the vacancy.

The pawl on the piece at H is double acting, and is used to reverse the motion of the screw, so as to draw the heel piece towards the toe piece, when it is desired to take out the stretcher after the boot is stretched.

In conclusion, we may say that having, by the use of this stretcher, made a pair of intolerable boots quite easy and comfortable, we conclude that it is an excellent device for the purpose intended.

Patented June 13, 1871. The entire right, or portions, will be sold. For further particulars address Dr. Bardin, as above.

Improved Bee Hive.

This hive is made of wood, of suitable size and proportion. One side is hinged and swings open so as to expose the interior and allow of the removal of the honey frames and boxes. The top of the hive is also hinged, and is fastened down by hooks. Ventilators, which revolve on central screw pivots, each having one or more orifices which register, with fly holes, are used (by turning or revolving them) to either allow the bees to pass through, or in and out, or close the holes. The ventilators in the upper portion of the hive have a screened orifice, which allows air to enter but excludes the bee. The friction of the ventilator on the outside of the hive is sufficient to hold it in any desired position. The honey frames are made with double beveled cross bars, and placed side by side in an upright position. The upper cross rails of every alternate frame are dropped down, which allows a free passage upward between the frames, not only for the bees but for ventilation. The honey boxes have slat bottoms through which the bees gain entrance to them. By dropping down the upper cross slats of every other frame, the bees, the heat, and the air are allowed free access to the honey boxes.

The slats of the bottoms of the honey boxes correspond with and cover the top rails of the alternate frames. The bees by this arrangement are prevented from attaching the comb formed in the honey boxes to the rails of the frames. The hive is so ventilated, and the frames are so constructed and arranged with regard to each other, that free access is given to every portion of the hive, and the interior is kept at an even temperature. William M. Henry, of Leo, Indiana, is the inventor of this hive.

Bearing Plates for Railway Rails.

It is the object of this invention to provide means for preserving the ties or sleepers of railroads; and it consists in a metallic plate of any form disconnected entirely from the chairs and from the rail, except so far as it affords the latter a bearing.

This bearing plate is adapted to various other purposes than separating the rail from the tie of railroads. It may be used for bridges and platform timbers, and for separating cross timbers, for the purpose of diminishing the actual bearing surface, and allowing water or moisture to be absorbed by the atmosphere. Elijah Myrick of Ayer, Mass., is the inventor of this improvement.

SUNSHINE is a powerful treatment for diseases, if you aspire to health and happiness, you must allow the sunlight to come into your houses.