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|  | NEW YORK, FEBRUARY 13, 1886. |  |
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## THE MARVIN SAFE.

is therefore less able to successfully withstand the effect of intense heat, and would not be dropped while The building of which we herewith present views of shock of falling, to which nine out of every ten hot into the cellar of the burning building, the probthe two fronts (Fig. 3) was recently erected by the safes are subjected to in a fire. If it were known lem of safe manufacture would be relieved of one of its Marvin Safe Company, of this city, to replace the one that a safe would be called upon only to resist the most troublesome factors. Recognizing this fact, the destroyed by fire a few months ago. The building is a handsome and substantial structure of brick and iron, specially designed to meet the requirements of the work carried on in it and is of unusual strength, in order to safely bear the great weight brought upon each floor. A safe, during the various stages of its manufacture, passes from the basement, where the crudematerial is delivered up through the several de. partments to the top story, where it receives from the hand of the artist those final touches which render it ornamental as well as useful.

In the basement are the boilers and gines and the forging room. It becomes evident, when we consider the severe trials a safe is sometimes subjected to, that the frame should be of the strongest possible construction, and, to insure this, should be formed of this, should be formed of one continuous piece of
metal. A built-up frame not only presents more possible passages for the escape of the filling and the entrance of heat, but possesses less strength, and


Fig. 1.-SHIPPING YARD AT THE FACTORY OF THE MARVIN SAFE COMPANY. at the bottom of the frame, and is in turn fastened to the frame by rivets. The back plate is further secured by fastenings passing through the outer angle iron frame, through the back plate, and entering an inside system of angles.
The front frame of the safe is stepped to receive the door, which is correspondingly stepped. A new and admirable feature is here introduced. A tongue and groove extends. along or round the side, top, and bottom of the door openng, but not down the side against which the hinged side of the door rests. The door itself is made with a corresponding tongue and groove on like sides, so that the tongues of the frame (Continued on page 100.)


Fig. 2.-MARVIN SAFE COMPANY.-INTERIOR OF THE BROADWAY STORE.

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## is OUR AVERAGE RAINFALLDDIMINISHING?

This may not concern us individually, for any changes would be very gradual, but no question can be of more vital interest than the average permanency of our water supply. If there be evidences that atmopheric precipitation is steadily descreasing throughout the historical world, we cannot fail to recognize their mportance.
We shall, for the present at least, set aside geo logical proofs and confine ourselves entirely to recorded history, taking as our basis the oldest consecutive ecord, the Hebrew books.
The earliest traces of human history carry us to Asia in its central and southwestern parts, and the most re mote national movement of which we have any clear and continuous account is the migration of the Israelites from Egypt. After many years of devious wanderngs, the Jewish tribes made their appearance in the plains of Moab, on the east side of the Dead Sea, not far from B.C. 1450, that is to say, somewhat over 3,300 years ago. An expedition was sent up by Moses, and made conquest of all the rich agricultural region to the north. The land was then swarming with inhabitants who were wealthy from commerce and from the cultivation of the soil. Their walled towns were numerous and strong. We need no evidence from the Bible to show us this, for there the towns stand now, perhap 4,000 years old, with many of their houses as perfect as in the days of Og , King of Bashan. There they stand, waste, without inhabitant."
There must be some reason for this, independent of ocial considerations. Men live there now, it is true only by the might of the strong hand, but they did so 3,000 years ago; it is not the lack of protection by es tablished law that has caused the desolation. The sim ple fact is that the land cannot furnish food for so dense a population. Its characteristic richness and fer tility have passed away, and for this there can be bu one cause, and that is the diminution of the annua rainfall.
It is well known that in the days of Chaldean glory the most fruitful land of antiquity was Mesopotamia. What is it now? "The land of great canals is desolat and barren, without settlement, a dried-up wilderness, - . . covered with the plants peculiar to a
saline soil, and all this where once was the 'garden of the world.'" These are the words of an eye witness.
A little further, and we reach Persia. The India Geological Survey says of it: "From the account given by ancient writers, it appears highly probable that the population was much greater and the cultivated land far more extensive 2,000 years ago than at present, and this may have been due to the country being more fer tile, in consequence of the rainfall being greater.
Captain Burton, writing of his travels in Midian, says: "This once wealthy and commercial land has become a desolation among the nations; the area of some 3,000 square miles, which, thirty-one centuries ago,could send into the field 135,000 swordsmen, is abandoned to a few hundreds-half peasants, half nomads.'
Additional proofs of this slowly progressive desicca tion could be brought forward, but we prefer to turn our attention to the Western continent.
For our present purpose, we will go only to the southwestern portion of our territory, to the region west of the Rio Grande del Norte, to Arizona and New Mexico alone.
It is a fearful and a desolate region. Here and there is a running stream, but they are few, and of ten inaccessible, for the land is made up of mesas and barrancas. One rides across a bare plain of sun-baked earth, when suddenly he is brought to an abrupt pause by a chasm, with nearly vertical sides, perhaps 1,000 feet deep. In its flat bottom one sees, perhaps, a small stream, perhaps not, for in most of these barrancas there is no water whatever, except for a few weeks of the winter. The mesa is as dry as the heart of the Sahara. But presently one comes upon the ruins of a single house, or possibly a number of houses-a large village. And so one goes on, and finds abundant evidence of quite a dense population, long since passed away. Many of the villages were on the mesas, others were in the barrancas, and, what is most astonishing, great numbers of them were not down on the bottom land, but high up on the nearly vertical cliffs, half way and more from their base to their summit. Some of these cliff dwellings are built of quarried stone, some of them are actually excavated from the solid rock, like those of Petra in Edom.
Mr. W. H. Holmes says, in respect to their age: "So great has been the erosion, that many of the caves have been almost obliterated." And again: "At the base of the cliff there is an almost total absence of debris, so that the period that has elapsed since these houses were deserted must equal the time taken to undermine the solid rock plus the time required to reduce this mass to dust; considering also that the erosive agents here are unusually weak, the resulting period would certainly not be inconsiderable."
We might adduce abundant quotations from the various surveys, notably the later ones of Hayden, all showing this one thing, that an abundant population once occupied the wide land which is now given up to
barrenness and desolation. The region was then evidently " well watered, like the garden of the Lord," and this it certainly could not have been without a rainfall greatly in excess of that which now prevails.
One collateral fact is worthy of note, as a possible guide to the duration of time involved. One characteristic feature of the barren wastes stretching from Nevada southward is the nut pines, called commonly pinon. They are scattered here and there, and the nuts afford much food to the Indians. The trees are never large, but every one of them has the look of being very old. They are ragged, and battered, and torn by the storms of ages. But the point concerning them of interest to us now is this: there are no young trees among them. The nuts fall and never germinate, for lack of moisture. Where the pinons occur in mountain canons, supplied with water, the nuts take root as usual, but out on the desert plains the old ones are alone, and most surely when they are gone, there will be none in their place.
The inference, then, is plain that the nuts from which these present aged trees took their origin dropped on no such dry and barren earth as lies there now. It is no more certain that the cave dwellers of New Mexico and the men of the mesas must have had abundant water than that these pine nuts had it, and yet there stand the trees whose period of growth goes back to better days.

Carbonic acid as a fire extinguisher at sea.
The steamer Crystal, of the Arrow Line,from Dundee, Scotland, recently came into New York Harbor with a fire in her hold, which had been raging for ten days. The vessel is divided into four water-tight compartments, :separated by iron bulkheads. The one in which the fire was in progress is forty feet long, and extends from the upper deck to the keelson. Under the most favorable circumstances, a fire at sea is a terrible experience; the captain, however, maintained an admirable presence of mind, and at once ordored all the openings to be closed up and the hatches battened down. The cargo in that part of the vessel consisted of bales of jute, carpets, paper stock, and burlap, the smoke from which permeated the entire ship, and kept the crew outside for the greater part of the time. The decks are of iron, covered with wood, and great anxiety was felt lest the heat should fire the planking, and the whole vessel burst into flames.
Another source of grave anxiety was the possibility of the fore and aft bulkheads giving way, and permitting the fire a full sweep from bow to stern. When the fire was first discovered, the vessel was 700 miles east of Newfoundland. It was, however, with a full understanding of the danger that the captain decided to make straight for New York in preference to Halifax or other near ports, since it was only here that he could hope to secure such assistance as would enable him to save the vessel. The harbor was made at night, and it was not until the following morning that the patrol and fire boats could be summoned. After a fight of several hours, the fire was finally extinguished and the charred and water stained cargo discharged into lighters. Being of iron, the vessel itself suffered little damage from its temporary conversion into a furnace.
Though happily both crew and vessel were rescued, ten days of continuous apprehension made an experience almost as terrible as actual shipwreck. Such an occurrence forcibly brings up the question of suitable fire extinguishers for use at sea, for in this age of chemical and mechanical progress, it seems nothing less han gross carelessness that a large number of lives and an amount of valuable property should be placed at the mercy of preventable accidents. The laws of cornbustion are now well understood. Fire is no longer the mysterious element of the ancients. It is to us simply one of many chemical reactions which we repreent by a series of formulæ with the same facility that we describe the rusting of iron or the action of respiration. All three operations belong, indeed, to the same class of reactions. It is the combination of their elements with oxygen. In the case of fire, the combination of the carbon and hydrogen with oxygen is attended with the production of heat, and the particles of the combining body, by means of this heat, are rendered luminous, giving us the accompanying phenomenon of flame.
Opposition to this reaction means simply cutting off the supply of oxygen. Ordinarily, water is used for this purpose. It is opposed to fire only because it shuts off the atmosphere, the source of supply of the free oxygen. Water itself contains a large amount of oxygen- 88.88 per cent-but it is not available for supporting combustion, since the combining power of the oxygen is already exhausted; water is itself the product of the combustion of hydrogen. For the same eason, steam is also used for putting out fires. It becomes so soon condensed, however, and so soon diluted with air, that it is only effective when applied near at hand. A number of other substances might be mentioned which would be similarly fatal to combustion, but few of them are practicable until we come to carbonic acid gas.
'This was proposed years ago for use as a fire extin-
guisher, but though it possesses many of the best qual ities for such a purpose, it has never come into general use. It is readily procured, and cheap. It is heavier than air, and can therefore be poured over a fire very much as one would your water. It is not only incapable of supporting combustion, but is itself perfectly incombustible, being the product of the complete oxidation of carbon. Even when diluted with three volumes of air it will still extinguish fire. These qualities would seem to recommend it highly for a more extended trial than it has yet had. It shares one of the disadvantages attending the use of steam or any other gas. It soon becomes mixed with the air and dispersed, unless applied very near at hand, or from above, under such circumstances that it can be poured into the scene of the fire without having too many vent holes below for its escape. This limitation for the present prevents its general introduction in place of water, but there are certain conditions under which it is the extinguisher par excellence.
In the hold of a vessel, for instance, nothing could be better. It would not affect the buoyancy of the ship, it would not damage the cargo in the slightest degree, and it would extinguish the fire as perfectly as an equal volume of water. In several instances it has been applied to this purpose. The perfect inclosure of the hull makes it possible to fill the hold with carbonic acid gas up to the very port holes, and, if these be closed, to the deck itself. The gas is readily produced by the action of acid upon fragments of marble or upon sodium carbonate. One plan proposed for the application of this extinguisher on shipboard consisted of having boxes with perforated sides for the escape of the gas, placed in different parts of the hold and connected by means of copper tubes with a carbonic acid generator. On the detection of smoke or fire, the acid is admitted to the marble or other carbonate in the generator, and the resulting gas permitted to flood the hold or such parts as are in danger. As it is half again as heavy as air, the carbonic acid gas would sink immediately to the bottom, and conflagration could soon be made impossible. The entire apparatus is simple and inexpensive. The materials for generating the gas are always easily obtainable, and cost very little. Had the Crystal been supplied with such an outfit, it is probable that the fire in her compartment could have been put out a few minutes after its discovery.

## New Kind of Brick.

Messrs. Bleininger and Hasselmann, two German chemists, have, it is said, recently patented a method for obtaining "products that will be more resisting to humidity, etc., than ordinary bricks and tiles. After drying and grinding the clay, they make a mixture as follows:


The whole is heated to a temperature varying from 1,850 to 2,000 deg. C. $(3,362$ to 3,632 deg. F.). At the end of from four to five hours the argillaceous mixture is run into moulds, then rebaked in the ovens (always protected from the air) at a temperature of 842 to 932 deg. F. The product may be variously colored by adding to the above 100 parts: 2 parts of manganese for a violet brown, 1 part of manganese for violet, 1 part of copper ashes for green, 1 part arseniate of cobalt for blue, 2 parts of antimony for yellow, and $1 \frac{1}{2}$ parts of arsenic and 1 part oxdie of tin for white. These products arsenic and 1 part oxdie of tin for white. These products
resist the action of acids, and are well adapted for resist the a
sewers, etc.

According to the Fireman's Journal, some one advertised in a certain German local paper that another locality possessed a thrashing machine which was also very effective as a fire engine. The next number of the paper contained the following explanation: "Any one who advertises that at this locality we have a thrashing machine which can also be used as a fire engine is a liar, and even more, though he be as black and sooty as the devil himself; said advertisement is only for the purpose of ridiculing a mistake our noble fire brigade made at the late fire. They were in a great hurry, and in place of hitching their horses to the fire engine, they hitched them to a thrashing machine standing near, and drove quite a distance before they found out their mistake." And so it turns out not to be a combined fire engine and thrashing machine to be a
after all.

The Holly Manufacturing Company, of Lockport, N. Y., have just completed the water works at Fond du Lac, Wis., and they have been very satisfactorily tested. The engines are two compound Gaskill engines, of $3,000,000$ gallons each per 24 hours, and pump through 14 miles of pipe to 140 hydrants, etc. The water is taken from 4 six inch artesian wells 600 feet deep. The surplus from the wells is stored in an impounding reservoir of $2,500,000$ gallons capacity, which is to be reservoir of $2,500,000$ gallons capacity, which is to be
used for fire purposes only, and consumers are supplied used for fire purposes only, and consumers are supplied
direct from the wells. The contract test of throwing streams 120 feet high was perfectly successful.

The Best Temperature for Coating and Developing Dry Plates.-From some experiments recently made, which we find detailed in the Photographic News, we take the following interesting facts. Says the News: It is a theory that has been often insisted upon by others as well as ourselves, that, the emulsion once evenly spread on a plate, the more quickly this sets the better; and there can be no doubt that slowness in setting produces deterioration in quality, probably because the bromide of silver has time to settle somewhat while the emulsion is still fluid on the plate, leaving an insensitive film of gelatine on the surface and a film of precipitated bromide against the glass, the latter wanting the protecting gelatine, and therefore liable to fog.
In coating in a room whose temperature was but little above the freezing point, we found that the emulsion at $100^{\circ} \mathrm{F}$., a temperature about as high as we usually work at, poured on cold plates, set long before it was evenly spread.
In such a case, two alternatives are open to the operator. He may warm his plates and keep his emulsion at the normal temperature, or leave the plates cold and heat his emulsion to (say) $130^{\circ} \mathrm{F}$. At this temperature it will readily flow over very cold plates.
We tried experiments to discover whether any difference in quality would be found in working by the two methods. We were astonished at the result. The plates coated on the glass slightly warmed were all that could be desired; those coated with the emulsion at a high temperature on cold plates were much slower in deve opment, and showed a decided inclination to fog.
The time taken for the emulsion to set was about the same in both cases-probably not more than from one to two minutes-so time of setting cannot have been
the factor which produced the deterioration of the plates. Nor can the emulsion itself have been spoiled by the mere raising of the temperature, because it was after the cold plates were coated with warm emulaion that, the emulsion being allowed to cool, warm plates were coated with comparatively cold emulsion.
It appears to us that the deterioration is produced by the contact of the atmosphere--probably not of either the oxygen or the nitrogen, but of some impurity in it-with a thin film of hot emulsion.
The more we work at plate making, the more 99 factory emulsion-one capable of giving plates of a high degree of sensitiveness, and possessing all other good qualities-is the easiest part of the process. The coat qualities-is the easiest part of the process. The coat-
ing and drying of the plates form in reality the most difficult part of the work. The following few points may be laid down as established maximsin connection with plate coating and drying.
The plates should be coated with the emulsion at as low a temperature as will allow it to flow readily. Af ter the plates are coated, the emulsion should be caused to set on them as quickly as possible. The drying should be conducted in a brisk current of dry air at a mode-
rate temperature, and should never take more than twenty-four hours.
We were recently developing plates with the solutions very cold-probably the water was not above the maximum density point, say $40^{\circ}$ F.-and, as was to have been expected, we found development exceeding ly slow. This, however, we had not considered a dis advantage up till the time of our experiments, but we determined to try, by exposing two plates under the sensitometer, and by developing them with cold and comparatively warm solutions, to discover whether there was any real difference in result beyond the difference of time taken.
Here, fur a second time, we were much astonished at the result of our experiments. We used iced-or rather snowed-water to mix the developer for the first experiment. It was quite a quarter of an hour before the developing action seemed to cease. Of course, we kept the plate carefully protected from light during all that time.
The second plate was developed with a solution of the same strength as that used for the first, but the temperature was raised to $60^{\circ} \mathrm{F}$. The development in this case was complete in about two minutes. The two plates were fixed, and compared. The comparison was instructive. The plate which had been long in the cold solution was afflicted with stains and color fog to such an extent that, on placing it on a piece of white paper, the paper could not be seen at all through the parts that should have been transparent; the plate which had been developed rapidly in the comparatively warm solution showed the protected parts quite clear and without stains of any kind. A temperature of $60^{\circ}$
appears to be the best for all purposes.
With regard to the amount of detail brought out
by the cold and the comparatively warm solutions, by the cold and the comparatively warm solutions,
we may say that the advantage is slightly in favor of we may say that the advantage is slightly in favor of
the latter, but not much, excent when it is compared with solutions at a temperature so near the freezing point as is not likely to occur in practice. Solutions at $60^{\circ}$ give an advantage of about one figure of the sensiometer over those at $40^{\circ}$.
Packing Exposed Plates.-Says Mr. Wm. Brooks on this subject in the British Journal of Photography:

For a long time past I have been making experi ments with various materials for packing plates, which Ithink are suecessful. I am of the opinion that plain paper is bad for the purpose. For successful packing, thematerial used must be non-absorptive. By way of experiment, I perfectly dried some gelatin plates, and then placed between them some pieces of papier Joseph, and bound them together, and in twenty-four hours I exposed a plate and developed it, when it gave the structure of the paper, and I came to the conclusion that it was caused by the different degrees of humidity of the paper and the gelatin film, the humidity being equalized between the two; other papers also caused markings of a different kind under the same conditions. I then tried rendering the paper non-absorptive, by passing it,through a th.in alcoholic solution of shellac, using thin brown paper for the purpose, and then passing it through a rolling press, with good pressure to flatten it; this I found a great improvement; after plates being bound tightly together for a whole week, on developing no marking occurred.
I have tried various other substances successfully, namely, tin foil, lead foil, thin sheet gutta-percha; the latter seemed to answer the purpose better than any othermaterial, being perfectly non-absorptive of moisture, and I should say perfectly inert to the most sensitive of films; it can be purchased at the chemists' sundrymen or at the gutta-percha warehouses in almost any large town, and can be used over and over again. I do not for a moment suppose that plate makers would adopt this mode of packing, but for photographers, both amateur and professional, it will be of great service, for, as a rule, plates en route are changed
at night in the bedroom with but very little accommoat night in the bedroom with but very little accommo-
dation, and whatever method may be adopted, it must be expeditious. In summer time (dry weather), thin sheet gelatin can be used, such as is used for bonbons, without any color. Using gelatin is going to the other extreme, as it absorbs moisture with a vengeance; but I have found it answer, but give the preference to either the gutta-percha tissue or the shellac paper. I always prefer to cut whichever material I use as near the size of plate as possible. With care I have packed many plates with nothing between them without any damage occurring, but have kept them entirely under my own charge. The sheets can be carried in a flat tin box or a small portfolio of the size, or between two thick pieces of cardboard. I have every reason to believe that many plates are packed by the makers, in the pressure of business, almost hot, the outside papers they are packed in being of a much lower temperature, and any moisture given off flies to the films and causes stains, which seem unaccountable at times.
ppointment of a New Trustee for stevens institute We learn with pleasure that President Henry Morton, of the Stevens Institute of Technology, Hoboken, N. J., has been appointed to fill the vacancy in the Board of Trustees of the same institution caused by the death of Mr. Wm. W. Shippen.
In his letter announcing this appointment, Mr. S.'B. Dod, president of the board, says :

I feel that this is only your due as a recognition of your services and generous gifts to the institute."
' President Morton has been at the head of this institution since its foundation, by a bequest of Edwin A. Stevens, in 1870 ; and, in addition to other smaller donations, he, in 1881, fitted up a new workshop at a cost of over $\$ 10,000$, and presented the same to the institute; also, in 1883, he provided funds for establishing a department of applied electricity, devoting $\$ 2,500$ to the purchase of new electrical apparatus and paying the salary of the professor appointed to take charge of the new department.

## The Rabbit Plague in Australia.

Some time ago we published a statement of the ravages of rabbits in Australia, they having become so numerous and destructive that the authorities were alarmed, and puzzled to know how to get rid of the pests. It was stated that one of England's colonies had already lost two millions of sheep by them. One flock owner, it was stated, had trapped five thousand of the troublesome creatures, but that they were so numerous they must be killed by. the million to perceptibly check the rapid multiplication of these prolific and devouring pests. In a recent English newspaper we see that, although Queensland has not as yet been afflicted by the rabbit plague, attempts are being made to prevent their ingress into their territorial limits by erecting rabbit-proof wire fences on their boundary line. Tenders have been accepted for 2,550 miles of fencing wire and 450 miles of wire netting of small mesh. The order will be shipped from England forthwith. A route has been laid out, running for a distance of 300 miles to the intersecting angle of Queensland and New South Wales, and thence northward for 100 miles. The Queensland government have voted $£ 50,000$ for this purpose. It is estimated that 1,300 miles of fencing will have to be laid in New South Wales; while in Victoria so great is the demand for wire that the authorities have signified a willingness to forego the duty upon it.

## IMPROVED FIRE ESCAPE

The fire escape herewith illustrated-for which let ters patent have been granted to Mr. J. W. Wetmore, of Erie, Pa.-is extremely simple in construction, so that it can be readily understood and easily brought into use, is ready for use at once at the window of every story of the building along which it is suspended, and it may-be used by persons in the building to descend without assistance, and also by firemen to ascend to any story. The device consists of two endless ropes knotted together at intervals to form loops from $11 / 2$ to 3 feet long. This double rope is passed around a pul


WETMORE'S IMPROVED FIRE ESCAPE.
ley suspended either from a hook attached to the cor nice or to the inside of the upper window. If desired, a hook may be placed at each side of the window and two pulleys be used, as shown in the left of the engraving. The person descending passes one of the links under his arms, and controls his descent by holding the other side of the rope. An auxiliary endless rope other side of the rope. An auxiliary endless rope,
which is first looped in one of the links of the double which is first looped in one of the links of the double
rope, may be used to raise persons or objects, and rope, may be used to raise persons or objects, and
would be particularly useful in lowering a child that could not be safely held in one of the links. When the position of the pulley renders it necessary, friction rollers are placed on the window sill. It will be seen that the double rope can be operated from the window of any story or from the ground.

## IRONING BOARD.

Secured near the under side of the head of the board is a transverse cleat designed to. strengthen the board and prevent warping. Two short links are pivoted on the ends of a bolt passing through a block bolted to the board. The lower ends of these links are pivoted on the ends of a bolt secured in the lower leg of the board. This leg is made tapering, and is flat on it upper and lower surfaces, so that it can be used in


## ELLISON \& FEIGEL'S IRONING BOARD.

pressing sleeves or the legs of trousers. The upper end of the leg is extended beyond the links, and the extremity is finished obliquely to form a bearing parallel with the under surface of the main board. Several teeth are inserted in the bearing.
When the end of the main board is placed on the edge of a table, and the support is turned down to rest upon the floor, the upper end of the leg rises under the table edge, forcibly engages it, and holds the head of the ironing board in position. This fastening is made secure by means of a brace hinged to the main
board, and when the lower end engages with one of series of notches formed in the leg. The links allow a free adjustment of the lever support both in regard to the height of the table or bearing to which the ironing board is to be attached and in respect to the thickness of the bearing to which the clamp formed by the end-of the board and the extension of the lever support is applied. One of the bolts passing through the block holds in place an iron holder shaped like a hoiseshoe and bearing the words "good luck." The board will not tip, neither will it tip the table to which it is attached, no matter what weight is placed on the projecting end.
Further particulars concerning this invention can be had from Messrs. Ellison \& Feigel, of 38 South Diamond Street, Allegheny City, Pa.

## Francis W. Bacon.

Francis W. Bacon, widely and favorably known as a mechanical engineer and expert, died in Boston, January 13 , at the age of 76 years. He was a native of Southbridge, Mass., and served his apprenticeship in a Worcester machine shop. On becoming a journeyman, he worked some years in various New England cities, finally being forced by failing health to go to Cuba, where he remained three years as chief engineer on a sugar estate. Returning to the United States, he became associated with various business enterprises, and at the opening of the civil war was carrying on a machinists' supply store in New York. About this time he took up the steam engine indicator, which he was destined to do more to introduce into general use than perhaps any other one man. When first adopted, it was considered by the majority of engineers to be a mere scientific toy, of no practical value whatever. He believed in it, however, and suggested a number of improvements. To-day, thousands of the instruments are in use, their dictum being unhesitatingly accepted, not only in the engine room, but in the highest courts of the land. Mr. Bacon was a valued contributor to the Scientific American, the American Artisan, and the Boston Journal of Commerce. He was a member of the American Society of Civil Engineers and many other organizations, as well as a life member of the American Institute of New York.

## Another Remarkable Gas Well.

The Sanitary Plumber reports the greatest strike in natural gas yet made in Ohio, which occurred at Tiffin on the 19th ult. A well at that place was torpedoed with 400 pounds of rackarock and 25 pounds of nitroglycerine; at a depth of 156 feet. There were 300 feet of oil in the well at the time, and this was thrown to a height of 125 feet in the air, and was followed by an escape of gas, the flow of which Mr. Brownyear, the contractor, estimated at 630,000 feet per day, which would surpassany of Fidley's first four wells, and equal all of Bowling Green's combined. The shock of the explosion was felt in the most distant parts of the city, and thousands of people from the surrounding country hastened to the scene, led by a brass band, to welcome the new arrival. For the safety of the drilling appara tus the gas was piped a distance from the well, where it burned with great brilliancy, illuminating all the eastern part of the city. Over 200,000 feet of gas flowed during the night, and it is now steady at about 100,000 feet per day. Oil in considerable quantities for lubricat ing purposes has filled the well, and flows in a steady stream.

Proposed New Water Supply for Chicago.
A unique scheme for supplying Chicago with water has recently been proposed, and rests upon such plausible grounds that the Academy of Sciences has ordered an immediate investigation and report. A limestone strata underlies the city at no great depth, and outcrops in the bed of Lake Michigan, about two miles from shore. The stone contains numerous caverns and fissures which are filled with water from the lake, after it has percolated the intervening filtering courses. In a half a dozen wells which have penetrated the limestone formation, it has been found impossible to lower the water below the level of the lake, by the most persistent pumping. Based upon these observations, the plan of supplying the city with water by means of shafts sunk to the limestone has been proposed. It would take about $\$ 20,000$, it is said, to make the experiment. Great care would be necessary to exclude all surface water and drainage contaminations.

## IMPROVED BELLOWS.

The engraving represents a bellows particularly adapted for discharging insect powder on to trees or plants or about furniture, and also for blowing the loose sand from moulds used in casting metals, and for distributing facings over the faces of the moulds. The bellows is simple and durable, and is readily adjustable for its various uses. Secured to the top board of the bellows is a box for holding the pulverized substance it is desired to distribute. The box is connected with the bellows nose by a flexible tube, as clearly shown in the sectional view, Fig. 2. A wire gauze par-
tition is fitted at the inner end of the box nozzle, to prevent choking up of the powder passages by lumps or foreign substances. The box is filled through an opening bordered by a screw neck upon which the cap fits. When the handles are operated to force the air through the nose of the bellows, some of the air will pass into the box through a check valve pressed down lightly by a spring. This valve (Fig. 3) is so constructed as to admit air to the box at two levels; thereby insuring thorough agitation of the powder in the box and a more effective distribution of it through the tube and into the nose, where it is met by the main airblast and ejected forcibly from the nozzle, which is, proferably, provided with a rose head. When the bellows is to be used to distribute foundry facings, the passage leading to the box can be closed by a valve on the inner face of the upper board when the facings are not to be blown


## CAMPBELL'S IMPROVED BELLOWS.

upon the moulds-as, for instance, when the bellows is to be used for blowing loose sand from the moulds. This valve is operated by an arin on a crank lever pivoted in the board as shown in Fig. 1.
This invention has been patented by Mr. Geo. T. Campbell, of 935 Howard St., San Francisco, Cal.

## CLOTHES DRIER

This clothes drier, which can be attached to the wall of a room, consists of a sliding frame and folding dry ing rods, and is so constructed as to occupy buta small space and yet give a large surface for drying the clothes. The main frame consists of two uprights connected by cross bars and formed on their inner edges with vertical grooves, and provided with guides between which runs a sliding frame having grooved rollers. A rope attached at one end to the upper cross bar passes downward under a grooved pulley secured to the sliding frame, then upward over a pulley in one of the uprights, and ther down the outside of the upright to a clamping lever. At the upper and lower ends of the sliding frame are wedge-shaped blocks turning on pivots. To these blocks are fastened strips having holes to receive the hooked ends of the drying rods, which are made of galvanized wire.
To use the drier, the upper wedge-shaped block is turned on its pivot into a horizontal position and fastened by a pivoted latch, and the drying rods are spread apart to receive the clothes. The lower block may be


BOGLE'S CLOTHES DRIER.
adjusted in the same way. The sliding frame with the blocks and drying rods is then raised to near the ceiling, where it is brought in contact with the warmer air of the room, by pulling the rope, which is then fastened by the clamping lever. The wedge shape of the blocks allows a compact folding of the drying rods. More than two blocks, provided with any number of rods, may be used, as desired.
This invention has been patented by Mr John A. Bogle, of Milton, Pa. .

## THE PRINCIPLE OF THE LOOM.

When a loom is seen in operation, the ingenious mechanism that causes it to act is admired, but it is difficult at first to grasp the fundamental principle involved. We shall therefore give a demonstration of the apparatus by one of the best methods imaginable, and this consists in the manufacture of a loom by ourselves and then weaving with it. Two lead pencils, a visiting or playing card, some thread, a good penknife, and a wooden paper-cutter are all the objects needed. The loom consists of two pencils to serve as warp beams, and of a heddle cut out of a piece of cardboard with a penknife. The outfit is completed by cutting one or two shuttles out of the same cardboard, and winding thereon the weft that is to be passed through the threads of the chain. The pencils having been placed on the edge of the table, and held in position by means of a heavy book, as shown in Fig. 2, we begin the operation of warping. This is done as follows: To one of the pencils we attach one of the extremities of the chain, and, by means of a large needle, pass the other extremity through the first slit in the heddle, then pass the thread around the other pencil and through the first aperture, then around the first pencil, and so on, until the last slit in the heddle is reached. After this, in order to weave, it is only necessary to raise and lower the heddle alternately, when, as may be easily seen, the only threads carried along will be those that run through the aper tures. At each of these motions the shut tle must be passed between the two series of warp threads situated at different levels. A paper cutter may be used in lieu of a batten to push the weft home to the web.
This little apparatus, which may be easily and quickly constructed, will allow the me chanism of weaving to be perfectiy under stood, and may be considered both as an object of amusement and instruction. We got the idea of it from an analogous apparatus which is used on the government vessels for manufacturing what sailors call "sangle." $L a$ Nature.

## BRICKWORK.

Although the strength of a wall or piece of brickwork largely depends upon the bonding of the whicks, little importance seems to be attached to it by builders in general. The essential requirements of good bonding in brickwork are mainly that no two vertical mortar joints shall come over one another, and that there shall be little or no cutting of bricks. The method of setting bricks here, which is very largely in use, is to lay the brick stretchers with a course of headers in every sixth course, so that we have in five courses the vertical-joints over one another, thus violating the


Fig. 1.-ELEVATION

plan first course.


## PLAN SECOND COURSE.

most important rule of bonding. In external walls, where the header course would injure the appearance the custom is to run the stretcher courses right on at the face, the back being bonded in by cutting. Little can be said in favor of this method. It is supposed to be a "quick" bond, or one which can be quickly laid; but it is very doubtful whether' the time saved is any-
thing appreciable. The appearance is certainly not equal to the bond largely used in England, and known as the "Flemish," in which the bricks are laid header and stretcher alternately in the same course, and for strength it is decidedly inferior.


Fig. 1.-SHUTTLES AND HEDDLE MADE OF CARDBOARD


Fig. 2.-A SIMPLE LOOM.

Probably the strongest and most convenient bond in use is that of which an example is shown in Fig. 1. In his we arrive as nearly as possible at the requirements of a good bond. There is little or no cutting required, excepting at the quoins, where a half brick or "closer" is used to close the course, as shown in the sketch, at $a a, b b$, and $c c$. There are no two vertical joints over one another throughout the wall, and there are a larger number of headers than in any other bond. It is in this fact of the large number of headers that the superiority of the bond mainly depends. A brick wall requires greater strength in the direction of its thick ness than it does in the direction of its length. Most of ness than it does in the direction of its length. Most of
the weight carried by the wall, such as the floor joists, roof timbers, etc., rests upon the inner portion, and the headers will have the effect of throwing this weight over the whole thickness of the wall. In building upon loose or soft foundations, artificial bond, such as hoop iron bond, is often introduced between the mortar joints to strengthen a wall longitudinally; but this could not conveniently be applied in the direction of the thickness.
The only possible objection to English bond that can be taken is in its appearance. It may be granted that, when compared to the Flemish bond, it is someway heavy, but certainly it is in every way equal to the running bond, while its strength is greatly superior.

WINDOW AND DOOR HEADS
A very graceful and ornamental arch is that known as the Gothic elliptical, which is shown in Figs. 2 and 3. It looks equally well if carried out in brick or applied to stone for window or door heads, and is largely used in red brick and other buildings with a very excellent effect. In order that the appearance may be maintained, the curve should be carefully set out by rule. The following is the usual method: Divide the span, $A B$, into three equal parts at $C$ and $D$ From $A$ as center with radius $A \quad D$ describe the arc, From $A$ as center with radius $A D$ describe the arc
$D E$. Then from $C, D$, and $B$, with the same radius describe similar arcs. Draw lines from $F$ and $E$, through $C$ and $D$ respectively, to $G$ and $H$. Bisect the span at $K$, and raise a perpendicular, K J. Then the curve may be set out from center, $C$, for curve $A$ to $G$, from $D$ for curve $B$ to $H$, from $E$ for $H$ to $J$, and from $F$ for the portion of the curve from $A$ to $G$, which will complete the curve of the arch. The bricks are rubbed in order that the mortar joints may radiate to the center from which each curve was struck, excepting at the crown of the arch, where they must be eased some what, the key brick radiating to K , and the following pectively.
S. J.

Beer Brewing in New York and Brooklyn.
At the recent meeting of the American Society of Public Analysts, a paper was read by Dr. Otto Grothe on the brewing of beer as practiced in New York and Brooklyn.
Dr. Grothe had visited different breweries in both cities, and had analyzed different beers. As a result of his visits, he stated that bicarbonate of sodium was in extensive use by the brewers for neutralizing the acid, this substance being added in quantities varying from two to nine ounces to the barrel of 32 gallons. Grape sugar, glucose, and corn meal were extensively used as substitutes for malt, while hop substitutes could not be detected. Other substances found in breweries were juniper berries, isinglass, Iceland moss, cream of tartar, tartaric acid, salicylic acid, bisulphite of calcium, and glycerine. Licorice also is often sold to breweries, but it is not in general use. The beer is generally manufactured in much shorter time than in European breweries, and this is made possible by artificial clearing, done by adding a solution of isinglass and cream of tartar in water in the storing, i. e., pressure barrel.
Large breweries effect the cooling of their cellars by ammonia ice machines, and they have done away with the cooling pan altogether. Smaller concerns work with natural ice, which is considered as disadvantageous in every respect. While some breweries are kept scrupulously clean, others are sometimes very dirty, mucor and fungi growing on the walls and tubs.
The beer often contains bacteria and bacilli, and the lactic ferment is very frequently found in the product from breweries where ice is used. Saccharomyces apiculatus often occurs, to the detriment of the stock. The only means for preventing loss are constant watchfulness and frequent examinations with the microscope. An entire change of the yeast may be necessary in some cases to avoid some hurtful ferment, which will make the beer "sick." As the salary of an expert master brewer is high, some dispense with such a superintendent, and, as occasion demands, call in a " beer doctor."
In beer, as at present manufactured, Dr. Grothe believes that danger to health may exist in the use of large quantities of sodium bicarbonate and in tne excessive quantities of substances for cleaning the product, and he recommended that some legal limit should be put on the amount to be used. Dr. Bartley expressed the opinion that excess of bicarbonate of soda, or the presence of such ferments as would cause the beer to be technically called "sick," were the points calling for the special attention of officers of health.The Analyst.

## Cotton Batting for Water Pipes.

At the suggestion of Professor J. M. Ordway, a gentleman connected with the Boston Herald, during the ast cold spell, took two pieces of water pipe, which he filled with water, and exposed to the weather, with


Fig. 2-STONE WINDOW HEAD.


## Fig. 3.-THE GOTHIC ELLIPTICAL ARCH.

the thermometer at $22^{\circ}$. One of these he covered with cotton batting, the glazed kind being the best, and the other he did not protect. At the end of two hours, the water in the unprotected pipe was frozen, while after an exposure of six hours the water in the protected pipe was still liquid. ${ }^{-}$He says batting is easily applied, and should be put on to the thickness of from one to three inches, according to exposure. it can be held to the pipe by being wound loosely with twine, but should not be wound tightly.

## the marvin safe

## (Continued from first page.)

and the door interlock by the fit of the tongue of each one in the groove of the other, the tongues breaking joint with the frame and door. On its hinged side the door is provided with a heel tongue, or projecting flange which extends along its entire side, from top to bottom, without a break. When the door is closed, this flange projects into a groove of corresponding size within the first step of the front frame, thus closing and breaking the entire joint between the door and frame at the hinged side. This construction acts as a protection against the action of fire, as regards the opening of the joints of the safe by the warping of its frame.
The inner face of the door is made with a recess sufficiently deep to receive within it a bookcase protector, which consists of a sheathing of material so treated as to render it highly non-conductive of heat. The protector is so placed as to form an air chamber, and there by prevent any injury that might otherwise be communicated to the contents of the safe by the heated ironwork of the door. In order to obtain durability and strength in the hinges, they are made of annealed cast iron, and are securely riveted to the outside of the door and front plate, where they may be readily ex amined.
The Yale lock is placed next to the inner plate of the door, being connected with the dial on the outside by a small spindle unning through a hollow tube.
These safes are usually furnished with a heavy plate iron inner door. The space between the inside and outside doors constitutes an air chamber most nvaluable in prever invaluable in preventing the induction of heat
through the joints and over the flanges of the out side doors. The building of the frames and doors is done upon the fifth floor of the factory.
The most important ma erial entering into the construction of a fireproo safe is the filling. This should be permanently ef fective-that is, it should not lose any of its heat resisting qualities, no matter what may be the temperatūre of the office in which the safe is placed. Since, as is well known "no injurious degree o heat can be communicated to the contents of a safe so long as the filling will give off steam at $212^{\circ}$ F.," f follows that the property of generating steam or vapor is the most im portant of all considerations. The filling, which operation is carried on a the second floor, used in the

Marvin safe is a mixture of asbestos, alum, and plaster and it is to the good qualities possessed by this combination that the enviable record of these safes is largely due. Asbestos, while being indestructible by fire and highly non-conductive, can be reduced so as to retain its peculiar fibrous and interlacing or bind ing properties, and it is this form which is here used. It gives the required body to the plaster, enabling the latter to pack densely. It can be relied upon to bind the parts, and it affords the required clinging consistency to properly sustain the filling within the walls of the safe
Alum is present because of its ability to give off vapor or steam; it contains over fifty per cent of water, which is liberated by heat.
Although the highly non-conductive properties of plaster make it useful here, it is introduced because of its power to absorb and retain large quantities of water. Its use prevents the dampness so destructive to ironwork of safes and to mechanism of lock, boltwork, etc., and effectually guards against the loss of fire-resisting qualities through the evaporation of the moisture from the lining.
On the fourth floor the burglar-proof work is done. This is made with solid wrought angle iron frames, welded at all corners, with alternating plates of wrought iron and five-ply welded steel and iron combined, or with an interlining of consecutive plates of welded"steel and iron,"making it.impracticable for the burglar to drill the iron and then break away the steel. Each and every plate is confined to its place by heavy
steel and iron screws, with heads pointing inward, and not wo screws are placed in line with each other, all the plates being held together by heavy steel-headed conical bolts with nuts on the inside, over which the end of the bolt is riveted, thereby preventing burglars effecting an entrance by drilling or driving the conical bolts. The corners are all lapped with heavy, angle five-ply welded steel and iron. The conical bolts and steel plates are tempered drill-proof, and tested by drill under heavy pressure before leaving the factory.
Both the door and frame are stepped to fit each other, and in the face of each is formed a tongue and groove, so that when the door is closed there are two tongue and groove joints extending completely around the joint. In the bottom of each groove is a strip of felt which, when the door is closed, makes a perfectly air-tight joint. The door is hung upon double hinges, which permit each of its inner edges to be forced against the seat. Extending across the door is a bar journaled near each end in lugs projecting from the face of the door.
In the center of the bar is a handle arm, and at each extremity is an eccentrically placed pin; when the

Photography of a Tiger and His Prey.
A photograph of a tiger in the act of seizing his prey has, through a lucky accident, been secured by an Englishman in India. His camera happened to be ocused on a buffalo which was tied to a stake some thirty feet away. A dry plate had just been put in place when a tiger leaped from the jungle, and with a single blow prostrated the buffalo. The circumstances were rather trying to the nerves of the operator, but he retained his presence of mind sufficiently to release the shutter before beating a hasty retreat. Some little time passed before he found it convenient to exam ine the result. Though the negative was poor, it gave a good idea of the relative positions. of tiger and buffalo and confirmed the generally accepted belief that the tiger, with his one knock-down blow, endeavors at once to dislocate the neck of his victim.

## The Crank Defended

What would we do were it not for the cranks? How解 the tired old world would move, did not the cranks keep it rushing along! Columbus was a crank on the subject of Aimerican discovery and circumnavi ration, and at last he met the fate of most cranks, was thrown into prison and died in poverty and disgrace. Greatly venerated now! Oh, yes, Tele machuts, we usually esteem crank most profoundly after we starve him to death. Harvey was a crank on the subject of the circu lation of blood; Galileo was an astronomical crank Fulton was a crank on the subject of steam naviga tion; Morse was a tele graph crank. All the old bolitionists were cranks the Pilgrim Fathers were ranks; John Bunyan was a crank; and any man who doesn't think as you do, my son, is a crank.
And, by the bye, the crank you despise will have his. name in every man' mouth, and a half com pleted monument to his memory crumbling down in a dozen cities, while nobody outside of your native village will know that you ever lived. Deal gently with the crank, my boy of course some cranks ar crankier than others, but do you be very slow to neer at a man because he knows only one thing and you can't understand him A crank, Telemachus, is a thing that turns some thing, it makes the wheel go around, it insures proress. 'True, it turns the same wheel all the time, and it can't do anything else, but that's what keep
projecting from the frame, and the other enters a side projection on a sleeve moving upon a bolt passing through the two outer hinges. It will be seen that by turning this bar, by means of the handle, the door will be pressed into its seat. The bolts are then shot out to lock the door. The spindles of the lockwork and boltwork are made drill-proof, and are built into the doors with a steel hub, so as to make it impossible to draw, drive, or drill them, thus giving ample protec tion against gunpowder or other explosives.
When required, vault doors (which are made on the fourth floor) are constructed both fire and burglar proof. The outer door is then made of compound fiveply welded chrome steel and iron, two inches thick and secured by round polished bolts shooting out on all sides into a bolt frame of heavy bar iron, and locked with a Yals combination lock. The inner doors are made of heavy boiler iron, and secured by up and down bolts and Yale lock.
On the floor next to the top is the woodworking de partment, in which the interior of the safe is partition ed and provided with drawers, and in some cases the outside covered with cabinet work. Through the center of the building extends a shaft in which is an elevator capable of carrying the largest safe. The many fine horses which deliver the safes in and about the city are stabled on the third floor
From the shipping yard shown in Fig. 1 the safes are taken to the commodious salesrooms of the Marvin Company, at No. 265 Broadway, this city, shown in Fig. 2.

E NEW FACTORY. the ship going ahead. The thing that goes in for vari ety, versatility, that changes its position a hundred times a day, that is no crank; that is the weather vane, my son. What? You nevertheless thank heaven you are not a crank? Don't do that, my son. May be you couldn't be a crank if you would. Heaven is not very particular when it wants a weather vane; almost any man will do for that. But when it wants a crank, my boy, it looks very carefully for the best man in the community. Before you thank heaven that you are not crank, examine yourself carefully, and see what is the great deficiency that debars you from such an election. -Bob Burdette.

## Digestibility of Cheese

Klenze.-Of the eighteen varieties experimented with, Cheddar was digested in the shortest time (fou hours), while unripe skim Swiss cheese required ten hours for solution. There is no difference in the digestibility of all sorts of hard cheese, or all sof cheese, but all fat cheeses are dissolved the most rapidly, because, being open by reason of the fat, they are the more readily attacked by the solvent. There is noconnectionbetween the digestibility and the percentage of water present in the cheese, but there is some connection with the percentage of fat and the degree of ripeness. From examination of the quantity of nitrogen dissolved, the author concludes that, on ac count of its great digestibility, cheese is the most nour ishing of all foods, meat and eggs excepted.-Jour Chemical Society.

## Sorrespondernce.

## an Opportunity for Inventors.

To the Editor of the Scientific American:
The "new steam carriage" of French invention, described in the Scientific American of Jan. 9, and all similar vehicles, are of profound interest to the American people. Our towns and cities are filled with people who will not keep a horse, not because of the first cost, but because the horse is a heavy continuous expense, when idle as when in use. For a vast majority of people, this objection is fatal where a vehicle is desired mainly for pleasure purposes. No such objection applies to a steam carriage; with it the expense ceases with the journey.
The weight of this French carriage and the attention of a stoker are grave difficulties in the way of its general introduction. Let some of our clever inventors overcome these difficulties, and he will enrich himself, besides conferring a blessing on the millions. The employment of a small engine using oil for fuel might be a simple solution of the whole problem.
The wants of tens of thousands of our people would be fully met by a vehicle capable of a journey of ten or twelve miles without further additions to the initial charge of motive power. The writer has long been of the opinion that a couple of iron or steel cylinders of very moderate dimensions charged with ströngly compressed air and mounted on a light vehicle would answer every purpose.
It is to be seriously hoped that the entire problem will receive from our inventors the earnest attention which it so richly merits.

Columbia, S. C., Jan. 18, 1886

## Danger from Steam Pipes.

To the Editor of the Scientific American:
As there have been several articles in your valuable paper of late with regard to the danger of steam pipes in contact with wood or other inflammable substances, I thought the following might interest some of your readers.
We introduced steam heat in our house in the autumn of 1857. Several years later, the pipes in the cellar were inclosed in a box filled with sawdust, while at a distance of from fifteen to thirty feet from the furnace they were also wrapped with what appears to have been a woolen blanket cut into strips.
On taking down the boxing and sawdust, several days ago, I found the woolen wrappings charred on the inside, where they came in contact with the pipe. The sawdust had settled so as to leave the pipe bare, and above it the top of the box was considerably scorched, although the space intervening was from half an inch to an inch.
In -one place, where an inch board was jammed tightly between the pipe and the floor above, it was very much charred, being converted completely into charcoal on the surface. The steam pressure is never over four or five pounds at the most, and is generally much less.
The size of the pipe is two inches in external diameter. I send you specimens of the woolen wrapping and board.

Wm. Tatnall, Je.
Wilmington, Del., Jan. 23, 1886.

## Mind Cure.

To the Editor of the Scientific American:
I have just read a very interesting and well-reasoned article on the "Mind Cure," in the Scientific AmeRICAN of the 16th inst. For years I have made experiments on the subject, and had, in many cases, obtained striking results where the patients were uneducated people. It appeared so difficult to account for these results that I could scarcely credit the evidence of my own senses, until a medical friend, instead of laughing at me, as I expected he would, handed me a book out of which I send some passages which may interest those of your readers who follow up the question.
It is one of the clinical lectures on the principles and practice of medicine delivered by John Hughes Bennett before the Edinburgh College of Medicine, and the official position and responsibility of the lecturer must add weight to his utterances.
He speaks of the mind cure as the influence of predominant ideas on the body, and calls it "monoideism," and goes on to say: "In all the cases of relief, there can be little doubt that any benefit that did occur may be attributed to a strong belief, on the part of the patient, in the efficacy of the means employed. In recent times, more systematic attempts have been made in this way to relieve pain. This subject, however, is yet in its infancy, and has to be separated from the charlatanism which has hitherto been mingled with it. The labors of Dr. Eisdale among the natives of commencement to the ratíonal treatment of disorders by the means now alluded to, and there can be little doubt that, in no long time, its influence, when further studied, will be acknowledged. But how far this influence is dependent on the confidence of the patient, on
the belief of some mysterious circumstance which is presumed to produce the effiect, or on some unknown law regulating function, through the mind, further observation alone can determine."
Then Bennett goes on to say that the phenomena are wholly occasioned by predominant ideas in the individual, by suggesting thoughts to patients in various ways-definite physical impressions, etc. He says that remarkable cases have been met with, where a judicious application of this system has removed insomnolence or various kinds of pain, spasms, and other evidences
of excitement; where hysterical paralyses of the limbs of excitement; where hysterical paralyses of the limbs
or special organs of sense have been relieved or cured, and where the torpid functions of lactation, perspiration, defecation, menstruation, etc., have been rendered more active.
That is the summing up of Bennett's lecture. The mere fact that it was delivered to the students of a great medical college by one responsible for the orthodoxy of his opinions ought to secure for the question of "mind cure" a serious and earnest consideration, when, in Bennett's own words "there can be little doubt that in no long time its influence, when further studied, will be acknowledged."
H. G. Joly.

Quebec, January 19, 1886.

## A New Source of Seleniam.

## To the Editor of the Scientific American:

The success of Mr. Ch. E. Fritt's recent experiments with curved gold leaf and thin homogeneous plates of selenium for converting the sun's rays into electrical energy, also Crooke's experiments with the radiometer, and the many half successful and half completed experiments made by others in this direction, suggest the strongest possibilities of an unexplored field of great value, in which solar electricity is to play a prominent part. Selenium has been found to pos sess strange actinic properties, not yet half understood, even by the most persistent experimenter.
Owing to the scarcity and high cost of this substance, these investigations have not been pursued to the extent that is warranted by the success thus far attained. The Scientific American rightly refers to flue and chamber deposits of sulphuric acid works using pyrites for acid making as a possible source of supply of this valuable substance. In this connection I am able to point out a source of supply in our own country that should be ample to furnish all that is needed for experimental purposes, if not for extended use. All pyrites contgin traces of selenium, which accumulate in the flues and lead chambers of the acid works in sufff cient quantity to color the deposit red. In most cases the quantity of selenium in the ore is too small to estimate. The Milan mine, of Milan, N. H.. however, con in fact, from 0.02 to 0.25 , and even in some samples 0.5 per cent is found. Sulphuric or nitric acid solutions of the ore invariably yield the peculiar rose red color of selenium, and acid chambers running on this ore accumulate large quantities of selenium oxide. Strong sulphuric acid precipitates selenium; consequently, it may be obtained from the settling tanks of the acid works in very pure condition. No arsenic is present in the ore, as is usually the case, and the selenium is free from this nuisance, although some of the rarer metals may be there.
Tests of the selenium mud and deposits are now being made, and I hope to be able soon to report fully upon their composition. Since many acid works are using this ore, it will not be long before the selenium can be obtained in quantity. In the mean time, the Atwood Lead Co., of Portland, Me., will be glad to furnish samples of the mud for experimental purposes to any one who will take the trouble to send for it.
In this same connection I may be allowed to suggest that analytical chemists, spectroscope experts, and all those who wish to investigate and search for rare elearrd chamber deposits a subject quite worthy of their attention.
F. L. Bartlett

## Portland, Me.

Proposed Method of Firing Dynamite Shells. To the Editor of the Scientific American:
A few weeks ago you published an article describing the "Pneumatic Dynamite Gun," accompanied by an excellent engraving. The device appears to be a wellplanned, elaborate affair, but at the same time presents some objectionable features, such as being too bulky, and the liability of the disarrangement of some of its complex machinery. Of course, it is understood that the only difficulty in this matter is to start the projectile by a gradual and increasing force, so that it will not explode in the gun by concussion. Could not this objection be overcome by an arrangement of cone-shaped powder chamber with an expansion room behind the shell charged with dynamite?
My plan is to use a slow-burning powder and to ignite the cartridge at the forward or small end by a vent, electricity, or a needle and cap. When this takes place, the first gases of explosion, which cannot be of yreat volume, owing to the small area of the neck of the
is not subjected to a violent shock in starting. As it moves away from the breech, the space behind it is more rapidly filled by the gases on account of the increasing surface of the burning powder, therefore it is constantly impelled by an additional force, until it leaves the muzzle at about the speed of an ordinary cannon ball.
I would make my gun only slightly longer and much lighter than ordinary cannon. The shell should be long, with its greatest weight in the front end, so as to require little or no grooving of the bore. As there would be no sudden rebound, a light carriage could be used.
Hannibal, Mo., Dec. 30, 1885.
S. E. Worrell.

## The Birds and Gold of California.

To the Editor of the Scientific A merican:
In the Scientific American of Dec. 12, C. F. Holder contributes an article under the head of "candelabra Cactus and California Woodpecker," in which he relates the observations of himself and others on the peculiar instincts of the California woodpecker in regard to storing his future supply of food where it will be safe against the destructive effects of the elements and the depredations of other animals. I do not think the woodpecker is singular in his industry and ingenuity in providing for his future wants. The greater number of animals exhibit a like power of reasoning and judgment in their efforts to provide for themselves and their young. In fact, they display qualities in this respect that might be imitated with great advantage by a large class of the human race. The goodness and wisdom of the Creator are seen in the fitness of things hroughout creation, the nice adaptation of those qualities in every created thing suited to its enjoyment, perpetuation, and preservation.
I had a favorable opportunity to observe the peculiar habits of the California woodpecker while mining in the Sierra range of California. An incident will fully illustrate what I wish to say. Early in the fall of ' 50 I noticed a red-headed woodpecker, such as we have in the Middle States, busy from daylight to dark digging holes in the bark of a pine tree near our cabins. At my first leisure I visited the tree, expecting to find the bark infested with worms, but to my surprise I found it studded with acorns, but not protruding from the holes. The holes ran in regular lines around the tree, beginning about four feet above the roots and extending to the height of fifteen feet. The holes were dug with mathematical precision. The acorns were driven in large enid foremost (the contrary end put forward by Mr. Holder's bird), and the fit was so exact that no agency could remove them without cutting away the bark. No miser worked more incessantly or hoarded with greater care. When the rain confined us to the cabins, he continued at his work, laying up his treasures with persistent industry. As soon as he had pecked out a hole, he flew to an oak and selected an acorn, sometimes rom the ground, at others from the tree, to fill the place; and so perfect was his organ of size that I never saw him get one too large to go in, or so small that he did not have to hammer it to its place. The incident would be incomplete without giving the sad part of it. The persistence of his character would otherwise never have been known. Wishing to reload my rifle, preparatory to a deer hunt, I stepped out of the cabin to discharge it. The bird, as he labored on the side of his tree, made a tempting mark, but too distant, I thought, to be in danger; but it proved otherwise. I walked sadly down to the tree and picked up his remains, and to my surprise I found that he had worn down his upper bill to the raw flesh.
Frequently afterward I noticed magazines of acorns tored in the pine bark and some in the oak. They were put in to stay, and when the woodpecker wanted his dinner, he took it on the whole shell.
In the same number of your paper, Mr. C. H. Chase, of Bridgewater, N. S., makes the statement that the "first gold found in California, by James Marshall, was in the limits of the present city of Marysville, on Feather River, and not on the Sacramento." The history of Marshall's discovery of gold in California is. as well established and the location as well defined as the old "Plaza" in the city of San Francisco, and is not located at "Marysville on Feather River," nor on the "Sacramento River," but at Coloma, on the south fork of the American River, where Marshall was erectng a saw mill for Mr. Sutter. The mill was being built on a bar in the river, and when the water washed over the smooth, hard rock in the bottom of the tail race, carrying off the gravel and sand, the gold lay exposed to view in the little fissures of the rock.
The mill was never completed, but was in a good state of preservation when the writer saw it, two years after its erection.

Paul Oliver.
Perryville, Ashland Co., Ohio.

## British Bayonets.

The London Times says that on a recent test of several thousand bayonet now in use in the British army, being a fair representation of the quality of all, thirtythree per cent were found to be useless, for lack of stiffness and temper.

## IMPROVEMENTS IN ELECTRO MAGNETS

A new form of electro magnet has been designed by M. Recordon, and has been made to serve as the basis of several kinds of electric apparatus, including induction coils, electric bells, and motors. We take the following, with our engravings, from Engineering:
It is formed of an iron tube, T, with flanges of the same material, and on each flange there is made a flat, $m$, which represents the pole. To one flange there is joined a piece of iron, $E$, with an extension which serves to carry forward the lines that force, and so produce an approximately uniform magnetic field for a short distance beyond the pole, $m$. To the other flange there is attached an iron hinge, $G$, to which the armature, $A$, is pivoted, and thus the magnetic circuit is rendered continuous. The attractive force upon the armature continues almost constant from the position shown in Fig. 1, until the armature touches the pole, $m$, the length of this distance or stroke depending on the thickness of the armature. In large magnets it may be 5 centimeters ( 2 in .), and as there is a very considerable attraction beyond this limit, it will be seen that a long stroke may be obtained. As an example of the strength of these magnets, we may give the dimensions of one which will sustain a pull of 110 lb . on the magnet when excited by the current from these Leclanche elements: Length, $61 / 4 \mathrm{in}$.; diameter of flanges, $2 \cdot 4$ in. ; bore of tube, $1 \cdot 3$ in.; wire, No. 16.
Fig. 5. shows an induction bobbin based bobbin based It in ple. It is entirely of iron, and is fixed on a wooden baseplate. The ends of the primary coil are connected to the terminal, $b$, and the colum D . The secondary wire is connectd to two other terminals, which are hidden in the enraving by the graving by the In orer that the current may notstrike through the insulator to the flanges when flanges when he tension is ery great, two thin disks of wood are placed on the inner sides of the flanges, and the wire is wound between them. The make and break is produced by the armature, $\mathbf{A}$, which vibrates opposite the flanges of the bobbin in the well known way. The rate of its oscillation is controlled by the weight, $P$. The instrument shown in the figure has the following dimensions: Diameter, 3.27 in.; thickness of flanges, 0.2 in .; exterior diameter of cone, $1 ; 6 \mathrm{in}$.; interior diameter, 1.4 in .; distance between flanges, 1.7 in .; the primary wire weighs 216 grammes, and is 1 millimeter 0.04 in .) in diameter. The recording wire weighs 145 grammes, and is $\frac{17}{100}$ of a millimeter (No. 32) in diameter; it is laid in 31 layers. It is said that this bobbin produces results which are exceedingly striking in relation to its size
An electric bell constructed on this system is shown in Figs. 6 and 7, where it will be seen that great simplicity is secured, together with a very rigid construction.
A rotary motor suitable for light work is illustrated in Fig. 8. The armature is coupled by a connecting rod to a crank upon a shaft which carries a flywheel and a commutator. The commutator is so arranged that the magnet is excited when the crank arrives at the top of its stroke, and the circuit is broken at the other extremity of the travel

Paper of proper thickness is rendered transparent by soaking in copal varnish. When dry; it is polished rubbed with pumice stone, and a layer of soluble glass is applied and rubbed with. salt. It is stated that the surface is as perfect as glass.

At Tunbridge Wells, near London, a new reservoir has been constructed, capable of holding $45,000,000$ gal lons of water. In the construction of the reser voir, some new methods were adopted, which will be likely to interest many persons engaged in such work Eight acres of land was secured for the site, and the walls take up one acre, leaving seven acres covered with water. The excavations necessitated the removal of 120,000 yards of earth, which was used in the construction of two artificial embankments, each 156 feet thick at the base, and 27 feet deep, having a bottom surface of 21,418 square yards, which is con creted to a depth of 12 inches, while the slopes mea sure 13,222 square yards, and concreted with an average of 9 inches, the whole surface of concrete being after ward covered with asphalt.
At a dinner recently given to Mr. W. Brentnall, the engineer of the work, on its completion, in course of his remarks he said: "There are some features of en gineering interest in connection with these works. I will mention two only, which will perhaps allay the fears some may have as to the stability of the embankments. Storage reservoirs are usually so constructed that one artificially made embankment is required, which is built up in thick layers of earth of 11
ure from the ordinary method of construction was the adoption of an inner skin or layer of asphalt as the watertight material, in lieu of clay puddle, and to my mind there are several advantages in the adoption of asphalt. It is quite as cheap as clay puddle; should a leak occur, it can easily be found and stopped; it will prevent the growth of vegetable matter, and there will be no risk of the slopes being damaged by waves in rough weather. It has also a clean and neat appearance, and forms a fitting receptacle for filtered potable water. This plan of asphalting has also been adopted by an engineer in the construction of a re servoir to hold twelve million gallons.

## The Alcoholic Value of a Bushel of Corn

The Milling World, in answer to a correspondent, who calls in question the accuracy of a previous state nent in the same paper on the percentage of our cereal crop used in distilling, gives the following curious statement of the value of a bushel of corn when con erted into an alcoholic beverage :
Let our correspondent, says the editor, trace a bushel of corn, for instance, from the field to the drinker's glass. The grower works at least two hours in raising a bushel of corn. He sells the bushel for 30 cents on his,farm. He spends the 30 cents for two drinks, thus

Fig. 2.


Fig. 4


## IMPROVED ELECTRO MAGNETS.

 consolidated by its own weight (a very uneven and imperfect consoli dation, taking an indefi nite length of time), clay puddle wall in the center of the embank ment being relied on for water tightness. This sometimes fails, with most calamitous results. I made a wide depart
parting foreve
with his corn.
Now follow
the corn. It cost 30 cents, and is turned into seventeen quarts of intoxicating drink The distillers receive 40 cent a gallon for converting it into whisky The corn in its changed shape represents the original 30 cts. and the $\$ 1.70$ for the distill er, making its value at this stage $\$ 2$. Then the govern ment tax of 90 cents a gallon adds $\$ 3.85$ to the value swelling it to $\$ 5.85$. The bushel of corn now passes on to the job
rows or wagons, and salesmen and wholesalers, and through them to the reure from the ordinar method of construction, just explained, in construct ing the embankments in layers of earth fresh from the excavation, laid only 6 inches thick, with a little water added, and then rolled and cross rolled with a steam roller until each layer was reduced to about $31 / 2$ inches thick. By this method the embankments were at once consolidated equal to original earth, no subsidence whatever taking place, as is proved by the brickwork erected upon it remaining perfectly sound. Indeed, so perfect was the consolidation that, when the men were required to move some of it, it was like a piece of rock, and had to be picked out. The reservoir is, in fact, unique in this respect, and in that it has a culvert running through the center of it. This culvert is necessary, in order to carry the surface water which generally flows through the valley to the Medway. This again necessi tated extra cost, and involved great forethought, for it had to be constructed so that it should carry an immense weight. It passes directly through the cen ter of the two artificial embankments, and thus under neath the whole length of the reservoir. I am glad to say that my example of embankment construction has been followed in the north of England by an engineer of eminence, who is constructing a reservoir with an embankment upward of 100 feet high the rollin alone costing close on $£ 6,000$, which is money well spent, as the work is at once consolidated and the sta bility of the bank insured. Another wide depart-
tailers. By the time it has reached the retailers it has been "reduced" in strength and increased in quantity by the admixture of water and other more harmfu substances, so that its measure has at least been doubled, and the corn, when it begins to drop into the drinkers' glasses on the bar, represents about $81 / 2$ gal lons of drink.
Allowing sixty drinks to the gallon, the official bar average, the bushel of corn will furnish 270 drinks, which, at an average of 15 cents to the drink, will take $\$ 40.50$ from the pockets of the consumers. This, added to the $\$ 5.85$ put into the corn up to the time of reach ing the jobbers, makes a total of $\$ 46.35$. Subtract the 30 cents which the farmer received for the corn, and the balance, $\$ 46.05$, will show the amazing profits made by those who do not till the soil to grow the corn, but who multiply infinitely by scientific means the mis chievous powers of the grain, and who from this hurt ful multiplication reap easy, large, and reliable profits The original price of the bushel of corn is contained 155 rimes in the ultimate receipts from it. In this way the enormous wasting power of alcoholic drink can be easily understood. Our correspondent can follow a bushel of oats, rye, barley, malt, or wheat from the producer to the consumer through the same channel and in each instance his computations will satisfactorily answer his questions.

## Silvered Glass Balls for Signaling.

The silvered balls frequently seen in gardens are advocated by Mr. Hatt, in a note to the French Acade my of Sciences, for heliographic purposes, in preference to plane mirrors. Their advantage lies in the greater intensity of the luminous point, which can therefore be seen to greater distances. From experiments made by him during the past summer, he found that with sphere of small diameter the image perceived at 15 kilometers with a lunette had a splendor comparable o that of a star of the second magnitude in a field feebly lighted. Such an image, which can be produced at little expense, would, he thinks, be useful in topo graphical triangulation

THE BULLFROG. (Rana catesbiana, Shaw.) by c. few seiss.
In the first warm days of early spring, the bullfrogs quit the mud holes in which they have slept during the winter, and often congregate at ponds and still, muddy places along streams of water. Here the sexes unite, and the female deposits her. spawn. The eggs hatch in a few days, and the young frog enters his tadpole stage. Some of the tadpoles, when food is abundant and circumstances are propitious, develop legs, lose their tails, and become perfect frogs before cold weather sets in; but others remain in the tadpole state until the second year, as I have found large tadpoles of this species with well developed legs in the early spring. Dr Garnier says it always takes two years for the larvæ to mature in Canada. The tadpoles of this frog are large and stout; color, olive or gray-green above, the tail with scattered black dots, and white beneath. Before the fore legs have appeared, and the hind legs are only one-half of an inch in length, the tadpole measures five inches from the nose to the tip of the tail.
The bullfrog is a voracious eater, his prey embracing mammals, birds, reptiles, batrachians, insects, crustaceans, and mollusks. In the stomach of one shot in New Jersey, I found one meadow mouse (Arvicola riparius), two May beetles (Lachnosterna quercina), one ground spider (Dysdera), cina), one ground spider (Dysdera),
one potato bug, and one water beetle one potato bug, and one water beetle
of the family Hydrophilidæ. In another one from Maryland, caught in June, I found two large black scarabæan beetles (Copris carolina), ten May beetles, and one leaf hopper (Tetigonia). I have known it to devour crawfish (Astacus bartoni), little turtles, and snails of different species; and have heard from authentic sources that it swallows young ducks when there is an opportunity. A friend caught one near Trenton, N. J., which contained a young domestic duck. One which I placed with five full-grown frogs (Rana clamitans) took compassion upon them in their captivity, and swallowed four of them in as many nights. I have frequently found large stones in the stomachs of these frogs. It is not probable they were swallowed for the purpose of assisting digestion, but rather by accident.
A frog of the Halecina species, which I had in captivity for over two years, at length became unable to eat, and died. I found a large pebble wedged in the posterior part of its stomach, which no doubt caused its death.
The manner of hunting the bullfrog is either by shooting or catching them with a hook baited with a piece of red or bright colored flannel or a real or artipiece of red or bright colored flannel or a real or arti-
ficia- insect. When the frog is observed, it must be
quietly approached, and the bait dangled in front of it, when it will spring up, seize the bait, and hook itself, no doubt mistaking the flannel for a butterfly or moth.
Frog legs are presented for sale in Philadelphia game markets arranged in dozens, one dozen pairs being impaled in a series upon a stick. They are, of course, all sold for bullfrogs, but the far greater number I ever saw thus exposed for sale were the common ditch frogs (Rana clamitans). They may be as palat-


THE BULLFROG. (Rana catesbiana, Shaw.) ble as their
This frog is known by its deep, bellowing note. It can be heard on almost any summer evening where they are numerous, but most generally in early spring. The nearest approach to this note that can be repre sented by letters is "gurr-r-r-roun, gurr-r-r-roun!" with the accent on the last syllable, uttered in a deep rolling, guttural manner. On account of their note they are called "bloody nouns" in portions of the South.
The length of the head and body, in full-grown Pennsylvanian specimens, is from six to ten inches; of the hind legs, eight to twelve inches. In the South they often grow much larger, Holbrook says, reaching even twenty-one inches. It is found from Canada south to Florida and Texas, and west to Missouri.

The value of the exports of mineral oils for 1885 was $\$ 49,671,743$, against $\$ 49,457,116$ the year 1885 was $\$ 49,67,743$, against $\$ 49,45,116$
before. Imports for $1885, \$ 13,812 ; 1884, \$ 25,513$.

## OLD ORGANS AND PIANOFORTES

One of the most remarkable features of the late Inventions Exhibition certainly consisted in the exceedingly interesting loan collection of old and historic musical instruments. These were exhibited in the Albert Hall gallery, under the direction of Mr. A. J. Hipkins, whose intimate and practical knowledge of the subject proved of the greatest value, especially in he classification and arrangement of the several kind f instruments and musiol various sketches which we herewith publish illustrate some of the old organs and pianofortes which were included in the collection, and belonging to the Brussels Conservatoire, by whom we were favored with special permission to make studies for our pages.
The history of the organ commences at the earliest times, and it is certain that the germ of the most important parts of the instrument, even as we now know it, had been discovered long before the beginning of the Christian era. Moses, in the 4th chapter of Genesis, speaks of Jubal "the father of all such as handle the harp and the organ (ougab)." This instru ment, also called "pipe," "reed," and " syrinx," was doubtless nothing more than a series of reeds or tubes bound together, of varied sizes and of graduated lengths, like the ordinary "mouth organ" of the present day, and known from the myth of Pan as "Pan's pipes," or termed Pandean pipes, as shown by Fig. 1. The "syrinx was played by Greek and Roman herdsmen in the performance of their simple melodies. Afterward it was discovered that by cutting openings in the length of the pipes at certain intervals, more than one sound could be produced by a single tube, and subsequently from this rude model was developed the "Flute-a-bec." The penny tin whistle of modern times is a reminiscence of the primitive "squeaker" here referred to. The next development, based on the same principle as the ancient " bag pipe," was the addition of the wind chest or box, into which the lower ends of the reeds were fixed. Flexible tubes were employed with which to charge this chamber, and frequently two persons were employed to blow alternately in order to keep up a continuous blast, the player using his fingers so as to moderate the voice of the instrument, and prevent all the pipes from speaking simultaneously.
Fig. 2, reproduced from Father Kircher's " Musurgia" (a folio dated 1650), illustrates the most important improvement of the organ upon that last described, and which will be found depicted on a sculptured mon ument in the museum at Arles, dated XX.M.VIII Kircher's drawing shows an organ blown by the

mouth, with sliders or perforated slips of wood arranged under the inlets to the pipes in such a way as to shut off the air as desired by drawing the slips or sliders in and out from the front, as here delineated in Fig. 2. This contrivance furnished really the origin of the modern valve, and was unquestionably a great step toward the perfecting of the instrument. The Hebrew "Magrephah," also shown by 'Kircher, had two brew "Magrephah," also shown by "Kircher, had two
bellows attached at the rear of the wind box and worked from behind (the antitype of our modern harmonium), by which means a fairly uniform current of air wasobtained. The magrephah had ten notes, with ten pipes to each note, and it is spoken of as having stood in the Temple of Jerusalem.
In the Talmud the hydraulic organ is mentioned under the name of "hidraulis" or "ardablis," and several references could be added did space allow to show that windmill organs and hydraulic organs were well known as early as the 3 d century. A 4th century organ is thus described by a Greek epigram, attributed to the Emperor Julian the Apostate, who died A.D. 363 , in the following literal translation:
"I see a strange sort of reeds-they must, methinks, have sprung from no earthly but a brazen soil. Wild are they, nor does the breath of man stir them, but a are they, nor does the breath of mang forth from a cavern of ox hide, passes within beneath the roots of the polished reeds; while a lordly man, the fingers of whose hands are nimble, stands and touches here and there the concordant stops of the pipes; and the stops, as they lightly rise and fall, force out the melody.'
Theodosius, who died A.D. 395, erected an obelisk at Constantinople which has a sculptured representation upon it of an organ of great interest, and which we have here redrawn, because it illustrates a singular mode of giving weight to the bellows by men standing upon them, a method which was not unfrequently followed more than a thousand years later, as, for instance, at the old church of St. Ægidien, in Brunswick, which Prætorius illustrated in 1620, showing 20 bellows worked by ten men, each bellows having a wooden shoe upon it, the blowers holding a transverse bar and treading with their feet after the style of a treadmill. Julianus, a bishop of Spain in A.D. 450, says that organs were in common use in the churches of that country during his time, and in A.D. 666 Pope Vitalian introduced the organ into the services of the congregations, appointing also canonical singers. The Anglo-Saxons were acquainted, too, with its use, and as far back as the commencement of the 8th century the instrument was made and thoroughly appreciated in England.
Aldhelm, who died A.D. 709, tells us that organs at that time were ornamented with gilding. In the 9 th century they became common in England, and English makers constructed their instruments with Abbey, between the years $925-988$, St. Dunstan erected an organ with pipes of brass, and gave another similar one to Abingdon Abbey, besides those provided by him in several other English churches.
Elwin gave an organ to Ramsey with copper pipes " and a far-resounding peal." The MS. Psalter of Edwin at Trinity College, Cambridge, furnishes an early instance of the instrument as it was then known. In the British Museum, in a Saxon MS. of the 11th century is a drawing of the "Bumbulum cum fistula aerea," with brass pipes, but having no keyboard. The "Bumbulum" in this respectis like that described by Monk Theophilus in his "Divers Arts," which was written in the early part of the same century. We here draw from "Thesaurus Diptychorum," by Gori, dated 1759, a copy which is there preserved of a MS. drawing of an old organ, said to be contemporary with Charlemagne. It shows a pneumatic organ, blown by two bellows, and, like the Theophilus one, played by sliders from the front. King David, in the original MS., is playing the harp or lyre, and singing psalms, while beside the organ he is accompanied by a trumpet, a sort of violin, and a set of bells. Wulstan, the monk of Winchester, describes the great organ set up in that cathedral by order of Bishop Elphege, who died in 951, and Wackerbarth, in his "Music of the Anglo-Saxons," gives a full translation of the monk's poem descriptive of it.*
The first keyboard was employed at Madgeburg, at the close of the eleventh century. This organ had 16 keys, which were an ell long and 3 inches broad, as will be seen figured in Prætorius' "Theatrum Instrumentorum seu Sciagraphia," Wolfenbuttel, 1620. Harmony was then unknown, and plain chant did not require more than 9 to 11 keys, which was nearly their greatest extent. The spring box soon followed the introduction of keys, which at first were several inches wide, and were played on like carillons, as in Belgium, France, and Holland, by striking them with a sharp blow of the fist-"Clarions loud Knellis Portatives ad bellis." $\dagger$
Dom Bedos mentions some of these early organs as having keys 5 inches or 6 inches wide, whence, according to Scidel, arose the expression "organ beater."

[^0]From Franchinus Gaffurius' "Theorica Musica," printed at Milan in 1492, we reproduce an engraving showing an organist performing on an instrument with broad keys, which is very interesting; and it also shows long and short keys combined on one manual. Besides this, as Hopkins points out in his work on "The Organ," "the peculiar interest of the drawing represents the player using both hands independently of each other; the melody-possibly a plain song-being taken with the right hand, which appears to be proceeding sedately enough, while the left seems to be occupied in the prosecution of a contrapuntal figure." Regals or Portative organs, from the Italian "Rigabello," were used to give out the melody of plain song. A representation of a very early instrument of this kind figures in Lucinius' "Musurgia" (printed at Strassburg, 1536), and showing bellows fixed in the rear part, worked like that which M. Paul de la Roche has painted in his fine picture of Ste. Cecile, illustrated by us to-day from Forster's splendid engraving. One angel holds the instrument while the other blows the bellows as the Saint chants and plays upon the keys. The little Italian organ which we have sketched from the Brussels Conservatoire is another somewhat similar example. It is beautifully inlaid with ivory, and is richly ample. It is beautifully inlaid with ivory, and is richly
engraved with figure sculpture. The use of "Portatives" or "Regals" seems to have been almost univer sal, and frequent mention of them is made by old poets, as, for example, Gavin Douglas says:

## Schalmes, clariouns, portatives heard I ring."

At St. John's Church, Cirencester, and in the crosier of William of Wykeham at New College, Oxford Regals are represented, showing the usual form then in use. The Italian chamber organ, drawn next to the last named specimen, is a curious and singularly pretty little instrument with painted doors, which open on rude cross-garnet hinges, discovering inside a boldly carved and foliated front, which is gilded with various golds in high effect. The body is black, relieved by natural colored woods for the mouldings and the legs. A drawer occupies a central place below the keyboard, and the lower part would make the instrument very difficult to sit at. It is, strictly speaking, a "box of whistles," as Sir Christopher Wren called Father Smith's organ at St. Paul's Cathedral.
Our last drawing represents by no means the least interesting subject of our various.sketches. It shows an "upright grand piano." The instrument was made by Frederici de Gera in 1749, and it now belongs to the Brussels Conservatoire. The doors are nicely enriched with inlay veneer, and the center of the soundboard within the case is ornamented with a charmingly fret cut rose, a detail of which figures by the side of the general view of the instrument. The total height of the piano is about 9 feet 6 inches. The keys are rounded as shown by the detail sketch, reminding one of the manuals to the old organ in the church of St. Egiaien in Brunswick, previously referred to, and which were, perhaps, the very first to foreshadow the modern keyboard, not only
Building News.

## COWEN STEAM HOSE.

An entirely new departure in steam hose is shown in the accompanying cut. The novelty lies in its being made with cotton jackets outside tohold•arubber tube
 within. It depends for its strength to resist a bursting pressure upon the cotton jackets, A,
which are woven with which are woven. with running spirally the whole length of the hose. Thus it gets as great strength as mar-line-wound rubber hose, at less cost. The strength of rubber hose depends upon the adhesive power of the rubber between the different layers of the rubber ber steam has run through it a short time way. Then the hose swells or blisters and soon bursts. It is claimed that the "Cowen" hose cannot burst from this cause.
The "Cowen" hose has a lining, B, which is cured just enough to stick to the fabric strongly, and is thoroughly cured by the passing of the steam when in use. It thus has a much longer life than the ordinary steam hose, for when it gets cured to the point where the rubber hose is before being used, it will then have lasted as long as the ordinary rubber steam hose.
It is impossible to put such a tube into rubber hose, for you must cure the tube and the friction between the duck at the same time; and if the tube is undercured, the friction will be also, and so will have no strength whatever.
It is especially adapted for rock drills and dredging machines, and will stand at least double the water pressure of ordinary hose, and has been tested on a dredging machine for over three months where a hun-
dred pounds steam pressure is used.

It is used by many of the contractors on the new Croton Aqueduct, and is guaranteed to stand a steam pressure of 50 pounds three months.
The Boston Woven Hose Co., of 234 Devonshire St., Boston, are the sole owners and manufacturers.

## The Telephone Caveat of Antonio Meucci.

As a matter of curiosity, we give below the caveat of Antonio Meucci, the Italian who claims to have been the original inventor of the telephone. This caveat was filed December 28, 1871; renewed_December 9, 1872; renewed December 15, 1873.
The following is a description of the invention, ufficiently in detail for the purposes of this caveat:
I employ the well-known conducting effect of continuous metallic conductors as a medium for sound, and increase the effect by electrically insulating both the conductor and the parties who are communicat ing. It forms a"speaking telegraph without the necessity for any hollow tube. I claim that a portion or the whole of the effect may be also realized by a corresponding arrangement with a metallic tube.
I believe that some metals will serve better than others, but propose to try all kinds of metals.
The system on which I propose to operate, and calculatefor, consists in isolating two persons separated at considerable distances from each other by placing them upon glass insulators, employing glass, for example, at the feet of the chair or bench on which each sits, and putting them in communication by means of a telegraph wire. I believe it preferable to have the wire of a larger area than that ordinarily employed in the electric telegraph, but will experiment on this. Each of these persons holds to his mouth an instrument analogous to a speaking trumpet, in which the word may be easily pronounced and the sound concentrated upon the wire. Another instrument is also applied to the ears, in order to receive the voice of the opposite party.
All these, to wit, the mouth utensil and the ear instrument, communicate to the wire at a short distance from the persons. The ear utensils being of a convex form, like a clock glass, inclose the whole exterior part of the ear, and make it easy and comfortable for the operator. The object is to bring distinctly to the hearing the words of the person at the opposite end of the telegraph.
To call attention, the party at the other end of the line may be warned by an electric telegraph signal or a series of them. The apparatus for this purpose and the skill in operating it need be much less than for the ordinary telegraphing.
When my sound telegraph is in operation, the parties should remain alone in their respective rooms, and every practicable precaution should be taken to have the surroundings perfectly quiet.
The closed mouth utensil, or trumpet, and the in closing the persons also in a room alone, both tend to prevent undue publicity to the communication. I think it will be easy by these means to prevent the communication being understood by any but the proper persons.
It may be found practicable to work with the person sending the messages insulated and with the person receiving it in free electrical communication with the ground, or these conditions may possibly be reversed, and still operate with some success. Both the conductors or utensils for mouth and ears should be-in fact, I may say, must be-metallic, and be so conditioned as to be good conductors of electriity.
I claim as my invention, and desire to have considered as such for all the purposes of this caveatThe new invention herein set forth in all its deails, combinations, and sub-combinations.
And more_specifically, I claim-
First.-A continuous sound conductor electrically insulated.
Second.-The same adapted for telegraphing by ound or for conversation between distant parties electrically insulated.
Third.-The employment of a sound conductor which is also an electrical conductor, as a means of communication by sound between distant points.
Fourth.-The same in combination with provisions for electrically insulating the sending and receiving parties.
Fifth.-The mouth piece or speaking utensil in ombination with an electrically insulating conductor. Sixth.-The ear utensils or receiving vessels adapted to apply upon the ears in combination with an electrically insulating sound conductor.
Seventh.-The entire system comprising the electrical and sound conductor insulated and furnished with a mouth piece and ear pieces at each end, adapted to serve as specified.
In testimony whereof, I have hereunto set my
ame in presence of two subscribing witnesses.
Witnesses:
Shirley McAndrew.
Fred'k Harper.

## IMPROVED TREADLE FOR BICYCLES.

A novel and important improvement in treadles for bicycles and other pedomotive carriages, foot-propelled machinery, etc., is clearly shown in the accompanying engraving. The improvement consists of a short lever attached to the usual pedal pin extending several inches rearward, where it is hinged to a s winging fulcrum rod, which is hinged to the upper part of the fork, thereby allowing the lever to follow the crank motion with almost absolute freedom from friction, while at the same time it acts as a fulcrum for the lever, which, with the pedal, projects forward of the crank far enough to give a considerable advantage in leverage over the ordinary crank. The advantages of this construction are that, while adding but two pounds to the weight of the machine, it gives the rider more power in driving his wheel, and at the same time it shortens the foot motion several inches, giving a long, full down-stroke, which passes the dead center, with a comparatively short up-stroke. The crankpin can also be used as a pedal, giving a still shorter motion for down hill and easy grades, thereby avoiding the monotony of the continuous long motion of the ordinary crank. Another important feature is that by simply lowering the fulcrum rod, which can be done in two minutes, a small man can ride as large a wheel as he can climb upon.
It will be seen that the lever is so con nected that at the point in the revolution where the crank possesses the greates power, the fulcrum, axle, and crankpin are in the same line, which is at righ angles, or nearly so, to the direction of the pressure, thus giving greater power than the simple crank would. Owing to the an gle which the lever makes with the line of the dead centers when above and be low it, that portion of the path of the crankpin during which the power is applied is greater than one-half, and the re turn portion, during which no work can be done, is correspondingly less; so that with two opposite cranks the working portions of the revolutions respectively overlap each other, and the dead centers are practically eliminated. By varying the relative proportions of the two ends of the lever, and the corresponding crank according to the purpose for which the machine is required, it can be adapted to obtain either increased speed, as in racing, or an increased power, as in hill climbing According to the testimony of expert rid ers, these treadles are far superior to the ordinary crank, both as to speed and power. If necessary, ball bearings can be placed upon the crankpin, thereby re ducing the friction to the minimum
This treadle is the invention of $\mathbf{M r}$ Geo. J. Taylor, of Salt Lake City, Utah, who may be addressed for further par ticulars.

## Waterproofing Paper.

A new composition for waterproofing paper consists of the following ingredients, combined in the proportions stated, viz.: resin, 50 per cent; paraffine, 45 per cent; silicate of soda, 5 per cent. These ingredients are thoroughly mingled by heating them together, and by agitation. The paper to which the composition is applied is usually building or sheathing paper. The latter is taken in the condition in which it comes from the paper machine, being quite dry. A strip or strips of the paper, from a roll or other con venient holder, are conducted and drawn through the tank of hot composition, whereby the paper becomes well saturated with it, and upon emerging from the tank the paper passes between suitable rolls, which press any surplus composition from it, leaving it hard and smooth.
Sometimes the proportions of resin and of paraffine are varied from 5 to 15 per cent from those stated retaining about 5 per cent of silicate of soda. Thus the proportions of resin and paraffine may vary between 50 and 65 per cent of the former, and between 45 and 30 of the latter, making a composition by which the paper is rendered waterproof and durabie when exposed to the weather, and by means of which a sur face finish both smooth and hard is obtained.

## The Minutes Worth Saving.

The value of time is clearly demonstrated by Dr S. A. Allibone, in his "Dictionary of Authors," when he shows by a time table ítaking days in a year 313 , and working hours in a day 8) that 5 minutes lost each day is, in a year, 3 days 2 hours 5 minutes; 10 minutes is 6 days 4 hours 10 minutes; 20 minutes is 13 days and 20 minutes; 30 minutes is 19 days 4 hours 30 minutes; 60 minutes is 39 days 1 hour.

taylor's Improved treadle for bicycles.
mospheres might possibly be obtained in this way. If an air pipe communicated from this reservoir to the breech of our gun, air of 400 atmospheres pressure would certainly be able to follow up the 68 -pounder shot, with pressure and velocity able to discharge it with a speed of 1,600 feet per second, and, therefore, to do our work; but the apparatus would be full of mechanical difficulties.
"Liquid gases are known to be receptacles of enormous mechanical power. Carbonic acid gas, liquefied and shut up in a reservoir, generates large volumes of gas with great rapidity the moment it is permitted to expand. Other gases expand with still greater rapidity and force; and if we could conceive liquid gases to be easily made, safely carried, and comfortably handled, a charge of liquid gas bottled up in the breech of a gun would be a very effectual propelling power, and quite able to generate the force we want, and to apply it within the time we require. This system, however, is also beset with mechanical difficulties.
"The preceding illustrations of steam, compressed air, and liquid gases lead us on very instructively to the manner in which fire has become necessary to do the work of a gun A supply of heat is essential to the expansion of a gas, and a rapid supply is indispensable to the rapid performance of the work. In steam, the fire is not only external to the gun, but external to the boiler in which the steam is generated. In gunpowder, the fire is introduced into the inside of the gun, for the purpose of supplying the heat that is wanted to raise the gases to their elastic pressure, and to maintain them at that pressure while expanding. Red hot steam introduced into the breech of a gun rapidly cools down and loses its heat and power in expanding.
"If we could introduce fire into the breech of the gun at the same time, to maintain the heat of the steam and the water, the steam would become an admirable propelling force. Carbonic acid gas, expanding rapidly from the liquid into the gaseous state, cools down so suddenly as not only to lose its mechanical power, but to freeze into solid flakes of snow. If we could charge the breech of the gun with fire as well as with liquid gas, the fire would give it the heat it wants, prevent its congelation, and maintain its power to the end of the discharge.
"What gunpowder and guncotton do is really to provide a reservoir of gas and a fire to heat it simultaneously, and in the same chamber. In the case of gunpowder, the fire is fed with charcoal; in the case of guncotton, the fire is fed with guncotton wool-another form of carbon. In gunpowder, large quantities of carbonic acid gas are generated, possibly in the liquid state, and are heated by the internal furnace of the charge, possibly red hot. In like manner, in a guncotton charge, red hot water or steam is introduced with other gases, possibly also liquids, together with an internal furnace of flame; and thus the work is done-first, by the release of the gases themselves, and, secondly, by the continuance of the elasticity of those gases by the internal supply of heat. This is how gunpowder and guncotton really do the work of a steam gun, a carbonic acid gun, or there to expand itself into steam and expend its force any other kind of gas gun."
in giving speed to the ball.
"This expedient of Perkins is well worthy of study. It has both the defects and advantages of a gunpowder gun. The red hot water thrown into the barrel would have the fault of being too powerful at the beginning of its expansion and too weak at the end. The barrel would be filled partly with water and partly with steam; and as the water grew into steam it would lower its temperature and its pressure, so that the explosive force would fall off very much toward the end of the stroke. This is the inevitable evil of allowing the water to become vapor in the gun. When the steam is generated in a separate boiler, and freely admitted into the breech of the gun, there is reservoir enough of heat and steam to maintain the even pressure in following up the ball from the breech to the muzzle. It is the evil of charges converted into gas within the breech of the gun that their temperature and pressure are too high at starting and too low at the end. The steam gun would in this respect be the best of our projectile forces.

Compressed air has many of the advantages and some of the defects of steam; and the frequent use of the air gun has shown its convenience as well as its efficiency. Air can be compressed into a reservoir by mechanical force, just as steam can be raised in a boiler by heat; and by compressing 400 times the natural quantity of air into a given space, a pressure of 400 at-

The Electrolytic Cartridge for Blasting.
The cartridge consists of a glass tube of a diameter to fit easily into the borehole, which should be small. The tube is very strong, the thickness of its walls being about equal to the diameter of the bore. Two wires are fused into this tube, which is hermetically closed after being nearly filled with water rendered conductive with a little acid or some metallic salt. When this cartridge has been inserted into the borehole, and the latter tamped or stemmed in the usual way, its projecting wires are connected with cables serving as "leads" from a source of electricity. All being ready, the current is put on, and the current from the generator passes between the ends of the wires within the glass tube, and decomposes the water, oxygen being liberated at one pole and hydrogen at the other. This explosive mixture continues to accumulate as the decomposing action of the current goes on. It is to withstand the increasing pressure of these gases that the thick glass is required. So long as the ends of the wires are covered by the liquid, no spark can be produced to ignite the gaseous mixture; but when theseor one of them-are laid bare by the conversion of the water into gas, the current has to pass through the latter, which is then fired. The resulting explosion is extremely violent-more violent than that of nitroglycerine even.

ENGINEERING INVENTIONS.
A rotary engine has been patented by Mr. John W. Emerson, of Opoka, Fla. It has a driving
wheel with a central passage, and curved passages radiwheel with a central passage, and curved passages radi-
ating therefrom to and through the periphery of the wheel, to receive and discharge the steam or other drivwheel, to receive and discharge the steam or other drivshaft of the wheel from a supply pipe.
An automatic railway gate has been patented by Mr. James K. Patterson, of Crete, Neb. It has main bars pivoted to a aide post, and pickets hing-
ed to the bars, so that as the gate is lifted vertically by ed to the bars, so that as the gate is lifted vertically by the weight of an approaching train, the pickets will
hang down somewhat as a fan closes, and after the hang down somewhat as a fan closes, and after the
train has passed the gate will come down in place mainly by its own gravity.

## agricultural inventions.

A corn planter has been patented by Mr. John A. Cherry, of Roads, Mo. By this device the
corn is clucked by knife blades mounted on a revolving axle, which mark the ground at every hill of corn deposited, and the weight of the driver is utilized to deposited, and the weight of the driver is unilized to
effict the desired pressure on the runners and wheels for working the marking knives.
A seed planter has been patented by Messrs. James A. Roden and Nicholas C. Morgan, of
Deerbrook, Miss. It is more especially intended for Deerbrook, Miss. It is more especially intended for
planting cotton seed, and provides means whereby the planting cotton seed, and provides means whereby the seed discharged at one time can be regulated, the soil
packed upon the seed and the top of the row rounded packed upon the seed and the top of the row rounded
and the plows adjusted to work at any desired depth or be supported above the ground.

## miscellaneous inventions.

A revolving sign has been patented by Mr. John F. Bengert, of Brooklyn. N. Y. This invention covers a manner of constructing signs in such way
that they will be revolved by the wind, and thus attract attention, the construction being simple, and signs so put up not liable to get out of order
A lathe chuck has been patented by Mr. Edward Pement, of Esmond, Dakota Ter. This inven-
tion-relates to improvements on a recently patented improvement of the same inventor, and provides a simpli fied constructio
more effective.
A blind slat adjuster has been patented by Mr. Peter Rundquist, of New York city. The slats
have end recesses, and cranks with side lugs on their have end recesses, and cranks with side lags on their
stems engage with these receessed ends to turn the slate, while the slats can thereby be readily adjusted to any desired angle.
A cabinet for tobacco, cigars, etc., has been patented by Mr. Charles N. Swift, of New York city. It has a water receptacle and novel construction of capillary conductors, whereby the air throughout the
interior of the cabinet may be kept at uniform humidiinterior of the cabinet may be kept at uniform humidi-
ty, and the degree of moisture may be readily regulated.
A ticket case has been patented by Mr. William M. Stevenson, of Adelaide, South Australia. Combined with a containing case and its inclosed spring
pressed follower is a sliding cap with slots to receive pressed follower is a sliding cap with slots to receive
lugs on the follower, whereby tickets may be forced lugs on the follower, whereby tickets
out of the case one at a time as desired.
A vegetable grater has been patented by Mr. Peter Blum, of Orrville, Mo. It is made in cyl-
indrical form, of sheet metal, punched to form the cutting points, and attached at one end to a circular head, the opposite end being open, through which the grated
material is discharged, the cylinder being revolved by a material is discharged, the cylinder being revolved by a
An embroidering machine has been pat ented by Fridolin Schnelle, of West Hoboken, N. J.
This invention relates to improvements on the HeilThis invention relates to improvements on the Heil
man or Swiss embroidery machine, with special refer ence to those designed for embroidering handarerchiefs, and relating particularly to the construction of the im"A draught equalizer has been patented by Mr. Joseph M. Langston, of Berin, III. It is a device structed that with its nse an equal amount of the load will be drawn by each animal, the invention being an improvement on a former patented invention of the
A swimming apparatus has been pat ented by Mr. William J. Corbett, of Tucson, Arizona
Ter. To the under side of a plate made to conform to the bottom of the foot is pivoted a blade frame carrying a novel construction of feathering web, giving a
broad surface for the stroke, which surface is diminishbroad surface for the stroke, which sur
ed on the return movement of the leg.
A clamp for stopping leaks and bursts in pipes has been patented by Mr. William W. Knight, of Jersey City, . J. J. It has a side opening and interior
recesses at the opposite sides, with a pad of leather, copper, or other suitable material, concaved saddle, and
key, whereby the pad and saddle can be readily forced key, whereby the pad and saddale can
down upon a pipe and held in place.
A water elevator has been patented by Mr. Robert C. Dugan, of Millersburg, 0 . This invention covers special devices for lifting water by a windlos from wells, in connection with a carrier, with pul-
leys, by whilh the water may be carried horizontally to distance and delivered in a spout or as otherwise de ${ }_{\text {sired. }}$
A mechanical movement has been patented by Mr. Frederick Reed, of Solomon City, Kansas.
This invention covers a novel arrangement and combiThis invention covers a novel arrangement and combi-
nation of parts by means of which motion can be transnation of parts by means of which motion can be trans-
mitted from one crank to another, or from a reciprocatcating bar, avoiding dead centers.
A fetter for cows' tails has been patented by Mr. Benjamin S. Slinn, of Spring Valley, N. Y. I. rod having gpring clamps, whereby the attachment can be readily applied to and detached from a cow's tail, to provent the cow from switching her tail in the milker face

A safety attachment for watch pockets
nd similar uses has been patented by Mr. John H
Barnees, of Greencastle, Ind. It has a plate to be secur ed to the pocket with a chain-supporting hook and a lock, with a watch-securing device, whereby the watch may be
made fast and the chain passed up over the hook, so hat any strain only binds the watch more firmly.
A mail bag catcher has been patented by Messrs. Ethan Allen and William H. Harrod, of Sel lersburg, Ind. It is attached to a crane or post at the
side of the tracks, and so madethat at the same time a pouch is taken from the crane by the gripper on the car pouch is taken from the car by the gripper on the running in either direction.
A gas pressure regulator has been patnombined with the Fin. Hatield, of New York city, Combined with the inlet pipe and regulator having
valve apparatus operated by the gas pressure is a foote
and attached valve operated by the rise and fall of the and attached valve operated by the rise and fall of the
liquid constructed in such manner that the fioat valve nad the regulator valve shall be independent of each and the
other.
A
A telegraph sounder has been patented by Mr. Alphonso S. Keating, of Corry, Pa. The iuvention consists of a novel combination with a magnet coil
of a pivoted armature in which a diaphragm is held, to of a pivoted armature in which a diaphragm is held, to
be used as atelephone when the telegraph signals canbe used as a telephone when the telegrap signa1s can
not be understood readily, or as a telegraph instrument hen the telephonic c
A soldering iron has been patented by Mr. Henry M. Dizon, of New York city. The larger or which is removabaly fitted a copper tip, that may be in placed by another of different shape, according to the
per work required, the construction being such as to give
the greatest amount of metal to retain the heat at the he greatest amount of met.
A machine for sawing hoop poles has been patented by Mr. Edwin Powell, of Williamsport, Pa. This invention provides a machine with which the
hoop may rest fiat lat the point of sawing, whether the pole be bent or straight, so that crooked poles may be
cut with greater facility, and the gauge is simple, held rigidy at right angles to the saw, and moving freely therefrom in the arc of a circle.
A watchmaker's screw driver has been patented by Mr. Oliver L. Neal, of Waltham, Mass. It is also adapted for holding and working a drill, and has fexible thumb and finger pieces to allow them to be miniature pinion wheel and rack bar, whereby a screw an be turned in
A combination folding bed has been atented by Mr. Abraham T. McCurry, of Goodland, nd. It is adapted for construction with a bookcase or at tiee top for bed clothing, the bedstead being attached by plates to corner irons in the case, which irons constitute two of the legs of the bedstead when it is low-
A bark cutting machine has been patented by Mr. John C. Hagerty, of Santa Cruz, Cal. It eing.provided with knives, which cut off the ends o he bark as the latter is fed down a chute, the cut off nds of the bark being carried inward toward the hub of the wheel and then inward ejected to fall
An apparatus for dyeing has been pa ted by Messrs, John O'Connell and Frank E. Weeden, Providence, R. I. Combined with operating and and other novel features, intended to dye, wash, under pressure and a continual stream of either liquor, air, or gas, wool in the fieece, card balls, roving and yarn, in
hank or in spools, as well as cotlon, flax, and jute, and hank or in spools, as well as cotton, flax, and jute, and
A pump has been patented by Mr. Hiran M. D. L. Babcox, of San Francisco, Cal. The air lunger, the upper enlarged end of the pump case, and ne enlarged upper air chamber with a lower open end, barrel with a surrounding water space, the invention oing an improveme
A damper regulator has been patented y Messrs. Charles A. McDonald and Charles W. Townsend, of Portland, Oregon. This invention covers the working vapor, gas, etc., is used to close the damper or valve, also means for providing for the escape of
the vapor or gas after it has performed its work, and the vapor or gas after it has performed its work, and
for draining the connections of fluid or condensed vapor. or draining the connections of fluid or condensed vapor. regulator for steam boilers on the same principles, but
rent especially applicable to controlling the dampers in the ash pans of locomotive steam boilers.
A billiard cue tip fastener has been patented by Mr. Henry A. Harmer, of East Newark, N. J, tip, of two half screws or pins having lprongs passed into the tip, the half pins or screws being secured in the end of the cue, and thus holding the tip on the end of the cue, or the fastening may thus be permanently made with "glue. For State rights for this patent apply to J. Harmer, 236 Harrison Avenue, East Newark,

## NEW BOOKS AND PUBLICATIONS

The Practical Estimator. By J. D.
Sibley and A. O. Kittredg.
York: David Williams, 1885.
Furnishes in a compact form some very good
ints upon how an estimate should be prepared a ints upon how an estimate should be prepared, a
complete list of the items to be considered, and a table of rules and formulæ for calculating quantities. puzzling himself as to whether anything has bita gotten.

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Sufferers are not generally aware that these diseases
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science. Address Munn \& Co., Publishers, New York. Presses \& Dies. Ferracute Mach. Co., Bridgeton, N. J. Guild \& Garrison's Steam Pump Works, Brooklyn, . Y. Steam Pumping Machinery of every description. Wood Working M
Machine Co., "Jimited," 110 w. 3d St., WWiliamport, Pa Iron Planer, Lathe, Drill, and other machine tools of Iron Planer, Lathe, Drill, and other machine tools of
modern design. New Haven Mfg. Co., New Haven, Conn Curtis Pressure Regulator and Steam Trap. See p. 350. Best Automatic Planer Knife Grinders. Pat. Face Plat Bradley's improved Cushioned Helve Hammer. Bradey's improved Cushioned Helve Hammer. New
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Cyclone Steam Flue Cle
M1g. Co., Clevelana, $\mathbf{O}$

Curtis Pressure Regulator for Steam Heating Apparatus, Wate
ton, Mass.
TheaImproved Hydraulic Jacks, Punches, and Tube
Expanders. R. Dudgeon, 24 Columbia St., New York. Beon, 24 Columbia St., New Yok. right and Slack Barrel Machinery a specialty. John Magic Lanterns and Stereopticons of all kinds and prices. Views illustrating every subject for public ex hibitions, Sunday schools, colleges, and homelentertain-
ment. 136 page illustrated catalogue free. McAllister Dometing Optician, 49 Nassau St., New York. entions. Illustrated. Price, $\$ 3.00$. E. \& F. N. Spon ventions.
New York.
Friction Clutch Pulleys. D. Frisbie \& Co., Phila. Iron and Steel Wire, Wire Rope, Wire Rope Tram ways. Trenton Iron Company, Trenton, N. J. Pattern and Brand Letters, Steel Punch Letters.
Vanderburgh, Welis \& Co., 110 Fulton St., New York. Astron
servator servatory Domes, all sizes. Warner \& Swasey, Cleve-

Hadusvemurn
HINTS TO CORRESPONDENTS.
Names and Address must accompany all letters,
or no attention will be paid thereto. This is for our information, and not for publication. This is for our
References to former articles or answers should
give date of paper and parce or number of question References to former articles or answers should
give date of paper and page or number of question.
nquiries not answered in reasonable of itime should
be repeated, correspondents will bear in mind that
some answers require not a litte research, and,
though weerdeavor to roply to all, either by letter or in this endepartment, eech must all, either his by letter
Special
personal ritten rather than genmation onerat interent manters of
expected without remuneration.

(1) J. W. asks: Will you please inform me, through the correspondence column of the Scien IFIC Americin, of what the prisms of a Leclanche bat-
ery are composed? A. They are formed of granulated oxide of manganese, and a small percentage of cement material, such as shellac. 2. Is it necessary in all cases,
in the construction of a dynamo machine or electric motor, to use a smaller gauge of wire on the armature han on the electro magnets, and if so, in what ratio is the difference generally made? A. The winding of he armature and field magnet of a dynamo electric
machine depends altogether upon the use to which the machine is to be applied. It is not always necessary that the wire of the armature should be smaller than that of the field magnet. In Edison's large machines the winding of the armature consists of large copper
bars, while the winding of the field magnets consists of wire very much smaller the field magnets consists armature. 3. Is the carbon taken from gas retorts entical with that used in electric batteries. If so, how it prepared? A. It is of the same character, but of ctter quality than is generally employed. Battery
carbons are generally prepared from selected pieces of oke, pulverized and mixed with carbonizable cement, and afterward carbonized in a closed retort.
(2) E. M. D.-Oil barrels are painted with glue and any cheap color. Where large guanti-
ies are used, the color and glue, of the consistency of oil, is run through a paint mill. Chalk or whiting tempered with yellow ocher or indigo blue is the
color generally used. It is not for sale mixed. The color generally used, It is not for sale mixed. The
(3) G. W. D. asks: Can vinegar be dedorized without impairing its efficacy? A. The odor of vinegar will be lessened by filtering the fluid through
charcoal. Its strength will not be impaired by this
(4) A. C. J. asks: What is the best way to clean alabaster? A. Soap well, and wash with hot water. If stained, apply fuller's earth, pipe clay, or
whiting for three or four hours, then wash off. If whing for three or four hours, then wash off. If
very dirty and stained, first wash with nitric acid di-
(5) W. B. asks for a formula for making flint glass. A. The following quantities form a very excellent glass:
Fine white sand.

(6) R. C. B. writes: A bets B that there is only one pair of driving wheels on a locomotive. B
bets A there are two pairs. Which is correct? A. All re driving wheels that are connected with the cylinders, directly or indirectly.
(7) W. R. C. writes: I am interested in iameter and 8 inches stroke. Cutting off steam at half troke, what heating surface will I require to keep 100 pounds pressure running at 300 revolutions per minute?
Also, can a single slide ralve be used to cut off steam at Also, can a single slide valve be used to cut off steam at
half stroke advantageously? A. You will require 434 half stroke advantageously? A. You will require 434
square feet of heating surface in your boiler. A single square feet of heating surface in your boiler. A singla
slide valve can be made to cut off at half stroke, economizing 86 per cent of the initial pressure, for which the recommend you McCord's "Practical Treatise on Valve Gear," which we can furnish for $\$ 3$.
(8) R. F. desires a good cement that will cement asbestos, one that does not contain grit. A. See the article on "CCements," contained in Scientific American Supplement, No. 158. Ordinary glue would
be all that is necessary if the asbestos is to be used with
(9) W. A. O. asks for a simple method of testing coal oil. A. A simple petroleum tester is de-
scribed in Soientifio Amerioan Supplement, No. 288.

The principle underlying petroleum examination is the determination of the temperature at which the oil takes
fre or flashes. Heating a sample in a cup over a spirit lamp and applying a burning match or taper to the sur face until the oil flashes, and noting the temperature, is the crudest plan that can be adopted. Good oil should lash only above 110 deg . F.
(10) C. J. H. writes: There are many houses in Leadville whose ceilings, in lieu of lath and plaster, are covered with canvas and calcimined. In many cases, leakages of water from the roofs or uppe floors upon the canvas have caused fantastic stains to appear, A. The calcimine has not sufficient body by it self to cover the stains. By mixing with it zinc white the difficulty will be overcome.
(11) S. N. H. asks: 1. How to make an article known as aureoline, for bleaching the hair. A oxide perfumed. See description of its manufacture in Scientific American Supplement, No. 184, also con sult the article in No. 339. 2. The receipt for a liquid that is used to "show up" microscopes. It resembles a thin flour paste, but when viewed through a small mi croscope it reveals innumerable animalcules. A. The substance is tripoli
diatomaceous silica.
(12) W. M. R. asks: 1. How to set common slide valve in a stationary, locomotive, or ma-
rine engine. A. To explain slide valve adjustment fo various kinds of engines would take up too much spac mend to you a book on "The Slide Valve Precticall Explained," by Rose, \$1, or "The Slide Valve" by Explained," by Rose, $\$ 1$, or "The Slide Valve," by
N. P. Burgh, $\$ 2$, and "A Practical Treatise on Valv Gear," by McCord, $\$ 3$, all or any of which we can fur nish. 2. What is the rule for calculating the safe working pressure of steam boilers when the material dimen sion of construction is known? A. For cylindrical
boiler shells, divide the tensile strength of the iron by the diameter of the shell in inches. Deduct one-half o quotient for single rivets, or one-third, if double riveted iron in decimals of an inch and divide this sum by 4 a a factor for safety in working pressure. Thus for a cylindrical tubular boiler of good iron and well stayed heads, 48 inches diameter, say for tensile strength of 48,000 pounds to the square inch, with flve-sixteenth inch shell, double riveted, we have $48,000 \div 48$ inches $=$ 1,000 less one-third $=667 \times 0.625=416.8 \div 4=104$ pounds maximum of safety. 3 . What is the rule fo calculating pressure of water to the square inch when
the height is known? A. Multiply the height in feet by $0 \cdot 433$
(13) C. N. V. C. asks: 1. How to tune up a set of glasses to use as musical instruments? A.
Tones of musical glasses are dependent on the glasses and the amount of water used, this being determined by ear. 2. Where can the juice of the fruit of cajurio tree
be obtained, and at what price? A. There is no such tree known to botanists. 3. Is there any cure fo drunkenness, such as chloride of gold and other reme dies? A. We have but little faith in cures for drunken ness. The taking of medicine will not produce absti-
nence in an individual. It is a question of will power. nence in an individual. It is a question of will power.
The so-called double chloride of gold is said to consist of:

## Ammo <br> oine........................ grain. <br> Compernd tincture of cinchona <br> Water to make up..................... 4 ounces.

No gold is found in the preparation, and therefore its name is not even reliable
(14) C. H.-The continued application of any preparation of lead to the skin is full of danger. It can, beyond question,
(15) J. H. writes: With 5 pounds of pressure (steam), how many feet or inches or what surface
does it require to heat one hundred square feet of glass roof and sides of a greenhouse in order to main while the tht heat of 55 to 65 degrees in the house below zero. Also, the boiler surface necessary, etc. A. One square foot of heating surface to 8 square feet of glass. Wrought iron pipe is the best. for steam. Place along the sides of the house, both below and above the benches, $11 / 2$ or 2 inch pipe, according to size on
house. The boiler should have 1 square foot of heatin surface to 6 square feet of radiating surface, and should
have the water level in boiler not less than 4 feet below have the water level in boiler not less than 4 feet below
the floor of greenhouse. A horizontal tubular boiler is the floor of greenhouse. A horizontal tubular boiler
the best and most reliable. Steam heating for green $t$ is therefore not econo mical for small houses.
(16) H. W. asks for the best remedy to deafen a foor after the floor lis laid, but not yet sealed A. Nail furring strips on the sides of the beams 2 or
inches above their lower edge, and lath and plaster Then cross-fur the beams with strips and lath and plas ter for the ceiling.
(17) A. L. asks: What flux is used with hard solder? A. The usual flux for hard solder is borax. The common method of preparing it for use
on small work is to grind it up with water into on small work is to grind it up with water into
cream on a slate or porcelain slab, and apply it to th joint and to the solder with a brush.
(18) J. G. S. asks: What can I mix with lead to make it harder to bend, and no harder to met for small castings in plaster moulds? A. A small per
centage of antimony. Try type metal; it is an alloy of lead and antimony
(19) W. S. asks if there is any simple way of making it more difficult to pick a watch
from a vest pocket. I have had one watch picked from a vest pocket. I have had one watch picke out of my pocket, and don't care to lose another.
A. Various kinds of safety pockets are in use, but probably the best way to prevent the removal of your
watch from your pocket would be to wear a stout watch from your pocket would be to wear a stout
auxiliary chain around your neck, and carry it through auxiliary chain around your
the armhole of your vest.
(20) W. M. H. asks: What are the reans why electric clocks (regulated by a chronometer electric connection with them) are not in more gen eral use in towns? A. We believe that the use of
nch clocks is constantly increasing. Probably they would come into more general use if it were not for echean Wha
(21) W. E. S. P. asks: What metal, if any, held near a permanentmagnet, will strengthen the magnet ? Can it be done in any way other than that
cmmonly employed in the telephone? A. No metal ommonly employed in the elepphone? A. No metal
in its normal condition, held near a magnet, will in its normal condition, held near a magnet, will strengthen it, but by winding the magnet with copper
wire, or any other electrical conductor, and sending a current through the conductor, you may increase the trength of your magnet.
(22) C. W. M. asks: What substance placed between a piece of steel and a magnet will stop he atraction of the steel to the magnet, that is, hav A. A large body of iron placed near or in contact with the pole of a magnet will asborb its magnetism; but no insulator of magnetism has been discovered.
(23) L. G. asks: Which wagon draws the iighter-the one with large wheels or the one with
small wheels? A. The wagon with the larger wheel as the leverage of a large wheel over obstructions reater than that of a emall wheel.
(24) W. L. C. asks: 1. Why would not rapidy revolving disk of soft iron cut stone same as does cold iron rails? A. We think the stone wo expect to get the same effect upon the stone that is
realized in the case of iron. 2 . How can I harden iron realized in the case of iron. 2. How can I harden iron or steel to make teeth for circular saw to cat stone?
impossible to keep "borts" firmly in the saw. A We do not think you can harden iron or steel so that it will answer for the teeth of circular saws for cuting stone, because the extremely hard steel is too brittle to maintain a cutting edge. Probably the best way to make steel extremely hard is to heat it to the equired degree for hardening, and then plunge it into orcury. Care
(25) W. H. H. asks: Will you tell me if the chrome battery is equivalent to two crowfoot battelegraph line they work on a ground connection One cell of bichromate battery when first set up is
qual to two cells of gravity battery, but it rapidly run equal to two cells of gravity battery, but it rapidly runs $11 / 2$ volts, and about $11 / 2$ times the electromotive force of a cell of gravity battery. For information on bat
(26) W. C. R. writes: In making the ynamo electric machine of the Supplement, No. 161, I am told by an electrician, connected with the 14 are not the best sizes to use, that a flner wire on the rmature would increase the intensity, etc. A. The izes of wire given for the dynamo described in Supplement, No. 161, were for general purposes. Of course, if you desire a current of high tension, you can procure it only by the employment of flner wire. On the other hand, if you desire a current of low tenon, for electro plating and similar purposes, you will eed to wind your.armature with No. 14 or 16 instead of , and
(27) J. R. W. asks: How is it that the ticking of the telegraph instrument can be heard over
the telephone wire if the wires of each instrument run thephone wire in the wires of each instrument run parallel with each other for a short distance? A. The lectrical impulse passing over the telegraph line. It is simply a matter of electrical induction.
(28) C. E. K. asks: Can persons learn elegraphy themselves, and receive by sound with an ou could attain fair proflciency in telegraphy by studying the subject with the aid of a suitable instrument,
unt you might fall into habits which could not be easily but you might fall into habits which could not be easily
orrected. Better consult some good operator from orrected. Better consult some good operice
ime to time during your study and practice
(29) F. H. F. asks: In what way are he teeth cut in wood saws, hack saws, and gig saws ?
A. In the smaller sizes they are generally cut in a millin machine; a number of saws being clamped together, that one row of teeth will be cut through the
aws are cut one at a time by means of dies.
(30) C. A. Y. asks: 1. How large a gravity cell will it take to swing a ons, and how large should the electro-magnet and the wire thereon be? A. f your pendulum is properly constructed, two to hree gravity cells ought to keep it in motion. You will probably require a magnet with cores $3 / 8$ inch in diameter and $11 / 2$ linches long, wound with about six or ght layers of No. 24 wire. 2. By what process is the great heat obtained from the gasoline stoves or ma-
chines now used for analyzing and melting specimens of ore? A. The flame is urged by means of a blowpipe. Petroleum burners, on the principle of the atomizer, produce very intense heat. 3. How close may the
fues be placed in a boiler to generate steam with the fues be placed in a boiler to generate steam with the reatest rapidity for the amount of water? A. This depends so much on the diameter of the flue, the
ize of the boiler, and its position, that we are nnable o give you a deflnite reply. However, half the diameboilers.
(31) C. D. V. asks (1) how to make a torage battery which will give from 4 to 5 volts, its ness $11 / 8$ inches. A. We do not think a storage battery can be made to fulfill your conditions. A storage battery, to yield a current having an electromotive force of rom 4 to 5 volts, will occupy considerably more space than $4 \times 4 \times 11 / 6$ inches. 2. Also tell me how long 16 Fuller power inate cells, which are used to run a 16 candle A. We think you will find it impossible to run a 16
candle lamp with 16 Fuller bichromate cells. The
Fuller bichromate battery is not so well Fuller bichromate battery is not so well adapted to
continued use as the Bunsen bichromate battery. The Bunsen battery requires renewal once in from 4 to
days. days.
(32) W. G. asks how to make a battery to be carried in a belt, the two poles of which I wan to apply to the body by means of conducting cords and
disks; one that will last a week or so without re disks; one that will last a week or so without re
charging. Do not want a very strong current, or it wil burn the skin. Something that will take the place of an electric belt. A. To make such a battery as you re same size, and cut 24 sheets of blotting paper about the size of the plates, saturate 12 of the sheets of blot ting paper with a saturated solution of sulphate of cop per, and saturate the remaining 12 sheets of blotting paper with a weak solution of sulphate of zinc Placethe two packages of blotting paper together, theu
apply the copper plate to the paper saturated with apply the copper plate to the paper saturated with
the sulphate of copper, and the zinc plate to the paper the sulphate of copper, and the zinc plate to the pape
saturated with sulphate of zinc; now solder a wire to each plate and connect the wires with your electrodes The plates, together with the wet paper, may b
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a rubber case for inclosing the battery.

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\hline 35,875 <br>
\hline
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35,518
35,072
$\qquad$
 " 335,058 059
$\qquad$


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Plow and double shovel frame
comb......................
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Of Which the Public Knows but Little, Worthy Careful Consideration
To the Editor of the Scientifc American:
Will you permit us to make known to the public th facts we have learnea auring the past 8 years concerning diseased Kidness so easily break down? You are con diseased Kidneys so easily oreak down? You are conin favor of TRUTH. It is needless to say, no medical journal of "Code" standing would admit these facts for very obvious reasons.
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That we may emphasize and clearly explain the rela tion the kidneys sustain to the general health, and how cally speaking, to take one from the human body, place in the wash bowl before us, and examine it for the public benefit.
You will imagine that we have before us a body
shaped like a beun, smooth and glistening, about four inches in length, two in width, and one in thickness. It ordinarily weighs, in the adult male, about five ounces but is somewhat lighter in the female. A small organ you say. But understand, the body of the average size man contains about ten quarts of blood, of which may be called, many times a day, as often as through may be called, many times a day, as often as through
the heart, making a complete revolution in three minutes. From the blood they separate the waste material, working away, steadily, night and day, sleeping or waking, tireless as the heart itself, and fully of as much vital importance; removing impurities from 65 gallons of blood each hour, or about 49 barrels each day, or 9,125
hogsheads a year! What a wonder that the kidneys hogsheads a year! What a wonder that the kidney can last any length of time under th
treated and neglected as they are!
We slice this delicate organ open lengthwise with ou knife, and will roughly describe its interior
We find it to be of a reddish brown color, soft an and thread-like, starting from the arteries, ending in.a little tuftabout midway from the outside opening into a cavity of considerable size, which is called the pelvis, or, roughly speaking, a sac, whichitis for the purpose of holding the water to further undergo purification before it passes down from here into the ureters, and so on to
the outside of the body. These little tubes are the filthe outside of the body. These little tubes are the filis where the disease of the kidney first begins.
Doing the vast amount of work which they do, from the slightest irregularity in our habits, $f$ cold, fram high living, from stimulants, or a the
and one other causes which occur every day, they be come somewhat weakened in their nerve force.
Current of blood in the small blood vessels surreundin them, which become blocked; these vessels surrounding them, which become blocked; these delicate membranes which collects in the pelvis or sac; the tubes are at first partially, and soon are totally unable to do their work The pelve sac goes on distending with this corruption pressing upon the blood vessels. All this time, rememtered, is passing through this terrible, disgusting pus, for it cannot take any other route!
Stop and think of it for a moment. Do you realize the importance, nay, the vital necessity, of having the kid neys in order? Can you expect when they are diseased pure blood and escape disease? It would be just as rea sonable to expect, if a pest house were set across Broad way and countless thousands were compelled to $g$
through its pestilential doors, an escape from contagion and disease as for one to expect the blood to escape pollution when constantly running through a diseased kidney.
Now, what is the result? Why, that the blood takes up and deposits this poison as it sweeps along into every organ, into every inch of muscle, tissue, flesh, and bone, from your head to your feet. And whenever body is weaker than another, a countless train of disease is established, such as consumption, in weak lungs;
dyspepsia, where there is a delicate stomach; nervous ness, insanity, paralysis, or heart disease in those who have weak nerves.
The heart must soon feel the effects of the poison, as it requires pure blood to keen it in right action. It in for the natural stimulus crowd the impure blood through this obstruction, caus ing pain, palpitation, or an out-of-breath feeling. Unnatural as this forced labor is, the heart must soon falter, becoming weaker and weaker, until one day it sud
denly stops, and death from apparent "heart disease is the verdict!
But the medical profession, Jearned and dignified, calls these diseases by high-sonniding names, treats them alone, and patients die, for the arteries are carrying slow death to the affected part, constantly adding fue which here in our wash bowl are very putrefaction it self, and which should have been cured first.
But this is not all the kidnevs ha
must remember that each adult takes about seven pounds of nourishment every twenty-four hours to supply the waste of the body which is constantly going on, a waste equal to the quantity taken. This, too, the kid composing matter.
But you say, "My kidneys are all right. I have no pain in the back. Mistaken man. People die of kid otten, and yet they have never there had a pain nor an

[^1]of freling to convey the
so we may never know.
When you consider their great work, the delicacy of heir structure, the ease with which they are deranged Health and long life cannot be expected when so vita organ is impaired. No wonder some writers say are degenerating. Don't you see the great, the extreme,
importance of keeping this machinery in working order Could the finest engine do even a fractional part of this work, without attention from the engineer? Don't you
see how dangerous this hidden disease is? It is lurking about us constantly, without giving any indication of its presence.
The most skillful physicians cannot detect it at times, or the kidneys themselves cannot be examined by any means which we have at our command. Even an analy-
sis of the water, chemically and microscopically, reveals nothing definite in many cases, even when the kidney are fairly broken down.
Then look out for them, as disease, no matter whe nations, has its origin in the breaking down of these secreting tubes in the interior of the kidney.
As you value thealth, as you desire long life free from sickness and suffering, give these organs some attention.
Keep them in good condition, and thns prevent (as is easily done) all disease.
Warner's safe cure, as it becomes year after year be the kidneys, has done and is doing more to increase the verage duration of life than all the physiciansanc mild but certain, harmless but energetic, and agreeable to the taste.
Take it when sick as a cure, and never let a mont reventive, that the kidneys may be kept in proper o er, the blood pure, that health and long life may er, the blood



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[^0]:    * See Dictionary of Music and Musicians, by Sir George Grove, p. 578.
    + Poem of the "Houlate," 1450.

[^1]:    Why? Because the disease begins, as we have shown,

