
a WEEKLY JœÜRNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.


## IMPROVED GOVERNOR.

The new steam governor represented in the annexed engravings is claimed to give a perfect regulation of speed under all circumstances, and especially in case where, a variety of machinery being used, frequent stoppings and startings of the engine are rendered necessary. Its action is such as to allow of the use of iron contractible valves, thereby admitallo the cylinder, it is stated, the greatest possible boiler ting to the cylinder, it is stated, the greatest possible boiler pressure at each stroke of the piston, thus increasing the power and, at the same time, effecting a aaving of fuel, etc. The valves are balanced and, with the seat, are of such metal as will best sustain the cutting action of the steam. We are informed that they may readily be removed and replaced. A self acting safety stop action is also provided, which is operated by the falling of the gevernor balls; and an improved lubricating arrangement, allows of the admission of a constant stream of oil to the piston and valve.
Fig. 1 is a perspective view of the device, and Fig. 2, a sectional view of the lower and essential portions. Within the steam chamber, A, Fig 2 , is a cylinder pierced with two the steam chamber, A, Fig. 2, is a cylinder plerced with two sets of ports, B B. W ithin the corresponding perforations. It C , in which is made a row of corresponding perforations. It will be noticed that, in the position shown in the engraving, the apertures in the valve nearly correspond with the upper row of ports in the cylinder, while the lower set of openings in the latter are left unobstructed by the bottom of the valve being above them. No explanation is necessary to.show how both af ports are closed by suitable placing of the valve, both sef C. The latter in this rod is in two apertures, and both amsed to the rod, D. This rod is in two portions, the lower of which enters asco in turn, enters a ball, E, secured to the upper part of the rod. By this means the latter may be shortened or lengthened, and the valve, C, raised or lowered, as desired. Upon the upper portion of the rod are placed stops, F, Fig. 1. The balls and levers are suitably connected to the revolving head and ac tuated by bevel gearing it G.] When the govermar belt breaks, the balls fall, strike against the stops, F, and thus, by pushing down the rod, $D$, close the valve, $C$, and stop the by pushing engine. The the location while fall, fully half the distance between ing on the stops and shutting off steam, thus giving a wider opening to the valve when a heavy load is thrown on the engine when operating at low boiler pressure.
\& lever and weight, $H$, is connected with the valve rod by means of the ball, E, for the purpose of balancing the balls and holding the valve in position. A hook lever, $I$, is adjustably connected with the frame of the governor so as to form a stop for the lever, H , and preventits weighted end rising, the object being to prevent the valve closing on its seat and shutting the ports.
$J$ is the lubricating and $K$ the con densing chamber, the latter being provided with a suitable valve through which the oil passes to the rod, D, and thence down to the engine cylinder. It is claimed that the supply of oil is perfectly regulated.
Patented through the Scientific American Patent Agency, July 16, 1872, and August 26, 1873, by Mr. A. Mat son. For further particulars address Matson and Brothers, Moline, Ill.

Seventy-five Miles an Hour by Railroad-Success of the Pull. man Palace Cars in England. man Palace Cars in England short, stumpy things, rarely exceeding thirty feet in length, and a little over six feet high inside. Mr. Pullman has lately built and sent over to London, for trial, a train of his splendid drawing room cars, and our English cousins, among whom were the principal rail way magnates, have been riding back and forth in them for some time past on the Midland Railway. The appear ance of these cars in Fngland has mad nce juite a sencen, are spoke of in the highest terms of praise. Th English Mechanic gives the following description of one of the trials, when the cars were run for a distance of one hundred and twenty.nine miles at the


MATSON'S IMPROVED GOVERNOR.
long together, was run on Tuesdar, March 17, 1874, with a long together, was run on Tuesday, March 17, 1874, with a The train was timed very fast, so as to see if they shook about; the train stopped twice, as it was thought better to examine the carriage axles; but the tender would carry enough water for the whole distance. The trial was from Derby to London. The two cars are as long as four ordinary five-compartment carriages. The engine had the steam brake, and the cars and tender had the new air brake, which is being fitted to all Midland trains. The air brake will stop a heavy express of twenty five carriages, running seventy miles an hour, in 290 yards. The distance from Derby to miles an hour, in 290 yards. The distance from.Derby to
London is 129 miles. It is all on the block system, and all London is 129 miles. It is all on the block system, and all
trains were shunted for this special express. The train left Derby at $2: 30$ P.m., passed Trent at 2:40, 91 miles; arrived at Wigston at $3: 7,33 \frac{1}{3}$ miles; left there at $3: 12$, stopped at Bedford at 4:0,791 miles; left at 4:3, arrived at London at 5 P. м., 129 miles ; running time 142 minutes; but this does not show the speed, as the three stops and three starts took six minutes. Speed was reduced to twenty-five miles an hour over thirteen junctions, which each took a good minute leaving the time as 123 minutes for 129 miles, which ave rages over a mile a minute all the way. In one case, on a level piece of line, sixteen miles was run in $13 \frac{1}{2}$ minutes, about 75 miles an hour, and twenty miles was run in 19 minutes. The cars ran as steady as tables at 75 miles an hour.
" Dimensions of the engine that ran : Driving and trailing wheels, 6 feet $8 \frac{1}{2}$ inches; leading, 4 feet; barrel of boiler, 11 feet $9 \frac{1}{2}$ inches long, 4 feet 4 inches diameter; tubes $1 \frac{1}{2}$ inches across; inside cylinders, 17 by 24 inches; leading wheels out side bearings; driving and trailing wheels inside bearings; steam 140 lbs.; heating surface, 13,000 square feet; blast pipe, $4 \frac{1}{y}$ inches. Weight on driving wheels, 15 tuns; the side rods work on the bosses of wheels inside the outside frames; the tender carries 2,050 gallons of water, and three and a half tuns of coal. (Thirty five lbs. $a$ nile are burnt with an express of 26 carriages.) In this tríal trip she burnt $18 \frac{3}{4}$ lbs. a mile."
Speaking of another trial of the Pullman cars, Iron says : at the raver sixty miles an hour, and for a portion of the worsry says. "T serenty-five miles an hour. Our cotempor cars, and two parlor cars. Each caris 51 feet 6 inches long, 8 feet 10 inches wide, 13 feet in extreme hight from the rails, and 8 feet 6 inches from the floor to the center of the ceiling. It is supported upon two four-wheeled bogies by a double set of springs, half volutes and half elliptical, and by joints which prevent any lateral oscillation being conveyed to the body of the car. The couplings are automatic, being a pair of immense hooks which, when once linked, cannot be loosened, but by operating levers worked from the Miller platform, with which each end of each car is furnished. This platform resembles, in appearance, the platform of an ordinary tramway car. The buffers are central, and brought by the coupling close up to one another, so as to make of the train a complete whole, in which there is no unpleasant jerk when it begins to move. In fact the start was quite imperceptible.
"The greatest novelty to an English passenger is the facility afforded for passage from one end to the other of the train. To accomplish this a central space in each car is left unfurnished with sGats, just as in the tramway cars, but here the resemblance ceases. The Pullman parlor cars contain each seventeen comfortable armchairs, in two rows, capable of being turned half round and tilted Two small compartmen milies or private parties are at one fa milies or private parties, are at one end, and two more at the other, fitted as lavatories. The drawing room and sleeping cars are fitted with double benches in lieu of armchairs, in the recesses of which, at a minute's notice, can be adjusted small tables, so as to convert the interior into something resembling a coffee room, with the unusual peculiarity of softly cushioned seats. The tables removed, a pulling out of the seats fills up the eightrecesses with so many mattresses. A kind of cupboard above each contains bedding, and its door, moreover, forms, when open, the basis for another bed or berth. Partitions and curtains are also furnished, so that the utmost
privacy is secured. Private rooms and lavatories form part of the oleeping cars, while in each there is also contained a small rosm with a stove for warming the car by means of a small rojm
The minor details of the cars are too numerous to mention, though their neatness and ingenuity deserve notice. The windowe, with convenient blinds and plated bolts to regulate their opening, are a pleasant contrast to those we usually see. The lamps-six in each car-are extremely elegant, as is also the metal work-that which is decorative being bronze, and that which is plain nickel-plated. The black walnut woodwork, carved and gilded, and the neat Brussels carpet on the floor, cause the crimson velvet cushions and chairs to stand out perhaps a trifle too prominently, but with excellent effect, while the bright plated metal fittings, occasional looking glass, and the sides (almost all windows) give the interior of the cars not only a luxurious but a comfortab'e appearance.

## Srientifir smmerin.

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## THE EFFECTIVE POWER OF STEAM ENGINES.

It is rather the exception than the rule that manufacturing establishments have abundance of motive power. In those using steam power, a false economy in first cost is almost universally practised in purchasing insufficient boilers. An increased consumption of fuel is the result, which, for various rtasons, becomes greater from year to year, until the losses from this cause aggregate a fearful rate of interest on the amount intended to be saved. In many instances, from one fourth to one half of the fuel would be economized by the introduction of boilers of proper proportions for the power required. From how many smoke stacks throughout the land can great volumes of smoke, as black as midnight, be seen, at almost all times, rolling upward, carrying with them the most valuable portions of the fuel! Each one of these ad vertises a great waste, which is generally produced by the boilers being too small. The amount thus lost on an average coal-burning Mississippi river steamer wouid be abundantly sufficient to furnish gas lights for a city of ten thousand inhabitants. When steam boilers are of suitable proportions and furnaces properly constructed, this waste should not occur. A genuine fear of loss of fuel from too much boiler surface is quite common with proprietors, but it is very rarely that such actually occurs. It is safe to provide twenty per cent more boiler than cylinder horse power, while equal power in each will often serve the purpose; and yet it will, in most instances, be found that the cylinder con. siderably exceeds the boilers in measurement
Of equal importance is the size and construction of the steam engine cylinder. The naked rule that a certain pressure upon the number of square inches surface of the piston head will give the definite horse power, if followed out, will always cause failure. Omitting, for the present, the amount of friction, let us point out the principal reasons why this is so: It is well established that the economical use of steam half revolution with steam at the full boiler pressure. For this reason the flow of steam into the cylinder should be cut off at some portion of the stroke, and be allowed to exert itself expansively. There are two systems of accomplishing this: In the ordinary engine, by means of the slide or other
valve, closing the steam supply port at a fixed point ; the other, as in the Corliss type,through a governor acting upon the steam supply valve,cutting off steam when sufficient has been admitted to accomplish the number of revelutions per minute re quired. With the first-named engines, that regular speed may be had, it is necessary to use a governor. The princi ple upon which this governor always ac:s is that of securing less than boiler pressure in the cylinder by throttling the steam pipe, and rendering it impossible for the full pressure to reach the piston head. If a pressure gage be connected with the cylinder of an engine using a governor, less pressure will be registered than that shown by the boiler steam gage. When the pressure of steam in the boiler and cylin der becomes the same throughout the stroke, the governo is no longer of service, regularity of speed c
revolutions become less than those required.
With the Corliss type of engines, the full boiler pressuto enters the cylinder at the commencement of the stroke, and the motion of the governor determines at each half revolution where steam is to be cut off, that proper speed may be maintained. When the full pressure is necessary for the whole stroke, this engine fails the same as the other, a considerable margin of power being always essential. Very little addi tional power is gained in any engine by allowing the steam valve to be open at over half stroke, and much less is lost in the crank and by dead centers than is generally supposed. From the above suggestion, the necessary failure of engines when expected to yield the full boiler pressure power, in actual use is made quite apparent. If, besides allowing am ply for friction, a further allowance of twenty-five or thirty per cent is made for the governor and for a reserve, sufficien power in engines will generally be provided. The omission to do this has caused many advertisements of "a good second hand engine for sale, having been replaced by a larger one.' Some engine builders practice deception by claiming to secure by patented improvements, great accessions in results. These pretensions are usually unfounded, and should not be allowed to reduce the sizes of cylindera.
Inattention to the temperature of feed water for boilers is entirely too common. When the escape steam of the engine can be brought into water heaters, no water should be supplied to boilers at much less than boiling heat. A heater that does not furnish it and a pump that fails to force it in at that heat should be thrown out at once.
We shall next week comment on the effective power o turbine water wheels.

## COMPARTMENT SHIPS.

It will be remembered that last year a large and splendid French steamer, plying between New York and Havre, the Ville du Havre, was sunk in mid ocean, in the night time, by collision with a sailing vessel. A large number of lives wer lost. The side of the ship was torn open, and the water poured in so rapidly that, in twelve minutes, the vessel went down. It was alleged that the doors in the dividing compartments of the ship were open at the time of the collision, and that influx of water was so rapid and unexpected as to have floated much longer, and might finally have been mos
We have now to record the loss of another French steamer, belonging to the same line, the Europe. Happily no lives were lost. This vessel sailed from Brest fur New Yırk, March 28, encountering rough weather and leaking a little from the start. It was alleged that she scraped her bottom in passing the bar.
On the fifth day out,a thousand miles from land, the leak had ncreased so much that the commander decided to leave the vessel, and all on board, four hundred in number, were transferred to a passing steamer, the Greece, and brought to New York. When finally abandoned, the Europe had 17 feet of water in her hold. Her cargo was valued at two millions of dollars.
The Europe was an iron ship: Length, 410 feet; breadth of bean, 44 feet; derth of hold, 37 feet; tunnage, 4,585 ; her engines were of 1,000 horse power, and she was divided into seven compartments.
It is now common in the construction of iron ocean steamers to subdivide the hull into compartments, each of which is interded to be watertight, so that, if leakage occurs in one, the others will not necessarily be affected.
It is obvious that, if the vessel were divided into a suff. cient number of strong independent compartments, the chances of sinking by leakage or collision would be very much reduced. In fact there are many examples on record of vessels saved by means of compartments. On the other hand, large numbers of compartment ships have gone down, but of these it has too often appeared that the partition; were weak or leaky, or ports between them were left opens or the compartments were too large. In a 400 feet ship, it is not customary to have more than seven compartments. But experience seems to show that this is too small a num. ber. The engine and boiler space now required is much smaller than formerly, and there seems to be no good reason why an increased number of compartments should not hereafter be provided.
As an example in this direction, we may refer to the new British war steamer Inflexible, which is to have 127 watertight compartmgnts.
For mercantile service, it would be unnecessary to employ so many compartments as this, but it is plain that the number might be considerably increased and the risks of disaster correspondently diminished
After the above was written, the sad tidings came of the loss of another ship belonging to the same line,the Amérique.
This vessel was almost similar, in size, power, and construc-
tion, to the Europe. The Amérique sailed from New York, April 4, and encountered a hurricane, near Brest, April 14 when the captain, acting under the impression that his ship was aleak, signaled another vessel, transferred passengers and crew, and abandoned the Amérique. The next day (April 15) she was found floating in the trough of the sea, by he captain of another steamer, who, on boarding, found 6 feet of water in the middle compartments, all the others being free. The Amérique's pumps were started, and she was then towed to Plymouth, England, vessel and cargo saved in good condition. The value of compartments is well illustrated in this instance. It is now believed that the abandonment of the Europe was unwarranted, and, as in the case of the Amérique, was an act of bad seamanship.

## A TREE THAT KEEPS A STANDING ARMY.

Among the varied means of defense developed by plants in their ceaseless struggle for existence, there is perhaps none more wonderful or effective thar that of a species of acacia which abounds on the dry savannahs of Central America. It is called the bull's horn thorn, from the strong curved thorns like bulls' horns, set in pairs all over the trunk and branches. These no doubt help to protect the tree from the attacks of browsing animals; but it has more dangerous enemies in the eaf cutting ants and other insects. Against these the tree maintains a numerous standing army, for which is provides nug houses stored with food, nectar to drink, and abundance of luscious fruit for dessert.
When first developed, the thorns are soft and filled with a weetish pulp, much relished by a species of small springing ants, never found except on these trees. Making a hole nea the point of one of each pair of thorns, these ants eat out the interior, then burrow through the thin partition at the base nto the other thorn, and treat it in the same manner. The hollow shells thus formed make admirable dwellings, none of which are left untenanted, as any one may discover by disturbing the plant, when the little warriors swarm out in orce and attack the aggressor with jaws and stings.
The leaves of the plant are two-winged, and at the base of ach pair of leaflets, on the mid rib, is a gland which, when he leaf is young, secretes a honey-like liquid, of which the ants are very fond. This ensures their constant presence on the young leaves, and their most zealous service in driving ff other insects.
A still more wonderful provision of solid food is made for a similar purpose. At the end of each of the small divisions of the compound leaflet, there grows a small fruit-like body, which, under the microscope, looks like a golden pear. When the leaffirstunfolds, the little pears are not quite ripe, and the ants are continually employed going from one to another to see how they come on. As these fruit-like bodies -which appear to have no other use than as ant food-do not all ripen at once, the ants are kept about the young leaves for a considerable time. When an ant finds one sutticiently advanced, it bites the point of attachment, then, bending down the prize, breaks it off and bears it away in triumph to the nest.
These ants, a species of psendomyrma, are found, as already noticed, only on these trees; and that the trees really keep them as a body guard seems evident from the fact that, when planted in localities where their little protectors do not exist they are speedily defoliated by leaf cutters, which let them everely alone on the savannahs, while their honey glands and golden pears offer no attractions to the ants of the forest Apparently both acacias and pseudomyrmas have been mutually modified in the course of time, until they are now quite dependent on each other for support and protection.

PROGRESS OF UNDERGROUND RAILWAYS IN LONDON
The length of underground railways now in operacion in London is about twenty miles, and they are being extended in various directions. From a recent number of Iron we learn that the extension of the Metropolitan Railway from Moorgate street under Finsbury circus is proceeding with rapidity. The Metropolitan Inner Circle Railway is to be completed from Aldgate. One new branch is to extend from the Metropolitan Railway, Queen Victoria street, under Friday street, Cheapside, curving northeasterly under Philpot and Rood lanes, by Cullumi street, under Fenchurch street to Aidgate, under that street, Whitechapel, Mile End, and Bow Road, to the North London Railway station at Bow. Another branch is from the line just described under Duke street Houndsditch, to Roper's Building, to the Metropolitan ex ension, to Meeting house yard, under Petticoat lane, Mid dlesex street, with a curved junction to unite with the Me tropolitan proper. Two more junctions will be made with the East London line at Stepney and the North London at Bow. All of these lines will be underground, the tracks being from 25 to 40 feet below the surface. The total length of the new lines is about five miles.

## A NEW COMET.

The discovery of a new bright comet is announced by the Academy of Sciences, Vienna, in 21 hours 23 minutes right ascension south, 6 degrees 56 minutes declension. An ob server at Yonkers, N. Y., states that it is nearly globular, about two minutes in diameter, with a decided condensation toward the center. In brightness it is above the average,but it does not in other respects present any notable difference from objects of its class. Its position at 4 o'clock A. M., of April 14, was approximately: Right ascension, 21 hours, 16 minutes, 31 seconds ; fouth declination, 5 degrees, 15 minutes. Its motion is toward the north and east.
An observer in this city states, April 17, that it rises at 2 A. M., east one half south. Half an hour earlier on April 24 .
It is a telescopic object.

## ANOTHER NEW MOTOR.

We have to acknowledge the receipt of a pamphlet containing a description of the "Keely Motor," and a report upon the merits thereof, by Charles Haswell, C. E. This report is addressed to Messrs. Israel Corse and F. W. Foote, Jr., of this city, gentlemen of prominence in commercial circles. The new motor has become the sabject of lively discussion among certain wealthy people here, by whom its success is considered certain. Every share of the stock has been taken, the offers of money having been greatly in excess of the supply of shares. The proprietors expect to reap a large harvest by the sale of rights when the invention is more fully developed--an event which is soon expected to take place. The follo

## кEELY-MOTOR,

Or hydro pnevmatic-pulsating-vacuo engine. Professor Faraday, of England, asserts that a grain of water conteins electrical relations equivalent to a very powerful flash of lightning." Knowing that the equilibrium of
these relations is sometimes destrōed in the heavens, merely by a change in conditions, resulting in enormous mechanical wors : and, as we are constantly discovering means to change natural conditions: the question arises (which seems a legitimate one) why are not our locomotives and steamships propelled with grains of water, instead of tuns? the only answer that can be given is: We have as yet no knowledge of suitable means to destroy the equilibrium of these relations."
"Mr. John W. Keely, of Philadelphia, has discovered a method of destroying this equilibrium, or something analogous to it, and made it the basis of an invention by which these conditions are changed.

## description.

During a period of about two months, several tests have been made of the Keely-Motor power, at Philadelphia, in the presence of many persons, several of whom were amony our
ablest civil and mechanical engineers and experts; the main ablest civil and mechanical engineers and
facts connected therewith are thus given:

By a peculiar mechanical deoice hitherto unknown, a force is generated which can readily be applied to driving all kinds of machinery for which steam or other motive power is generated and applied, without cost other than the mechanical device or gent rating machine and the necessary wear of muchinery. The generator is simple and comparatively inexpensive, occupying but a small space, and is light compared with
the requirements of steam power; and since this power is produced woithout heat. electricity, galvanism, magnetism, or chemicals, it is destined at an early day to revolutionize completely the present motive powers of the world, by reason of the economy of its cost and space.
"The power, so far as at present evolved and tested, has shown a pressure of fully 10,000 pounds per square inch, as the following explanation will show: The principal part of this power generator, now in use, is made of metal, globular in shape, about fifteen inches in diameter, and hollow, having walls about three fourths of an inch thick, a strong iron tube, an inch in diameter, connecting the generator with a cylinder used as a receiver of the power or force from the generator. This cylinder is made of charcoal iron, forty inches in length, four and one half inches internal diameter, with screw-fitted and welded heads, two inches thick, tested to a pressure of 10,000 pounds per square inch; its capacity is about three and one fourth gallons. This receiver was charged from the generator of the power in five seconds, and the power remained therein at least eight days without any addition, and from it a great number of tests were made without any apparent diminution of its energy or force.

At the end of the charged cylinder is attached a flexible brass conductor of drawn tubing, one fourth inch in diameter, with a bore of one thirty-second of an inch, passing from cylinder to ceiling, and thence to the other side of the room, for a distance of twenty feet to the test apparatus or force register; this apparatus consists of a thick bed plate of iron, to which was bolted and packed a cylinder four inches in diameter, having a plunger or piston, the area of which was a little less than one square inch in surface. Below this piston is a chamber of about two cubic inches, with which the tubing from the charged cylinder is connected. The the tubing from the charged cylinder is connected. The
plunger or piston, acting perpendicularly, was the point at plunger or piston, acting perpendicularly, was the point at
which the power was applied to a compound lever, which, according to Mr. Haswell's measurement, was as one to fifty two. The end of the short arm was securely bolted and fastened to the iron bed plate of the apparatus; upon the long arm of the compound lever was suspended an iron weight of 200 pounds. On opening the stopcock of the charged cylinder connecting the tubes, the weight of 200 pounds was at once raised to the limit of the upward movement of the lever; thus, with the weight of the lever and its connections, indicating a pressure power of about 10,400 pounds per square inch, as stated before. The power generator and receiver was supposed to be, when constructed, fully adequate in strength to generate and develop the full power of the invention, but it has been found too weak; the force has proved to be so enormous that Mr. Keely has not dared to apply more than half of the power he can attain. An apparatus is now in process of construction which will be able to generate and sustain a pressure greatly in excess of that already shown, without rupture, though Mr. Keely does not expect he will need one of more than 25,000 pounds to fully develop his power. When the full power is measured and balanced, it will then be comparatively easy to construct an apparatus of the requisite capacity and strength for engines of any desired power. When an apparatus of sufflient strength to allow the generation of the complement or maximum of force is constructed, and the vapor generated is applied to
the working of an engine, the exhaust vapor is at once re
solved into its original elements, and is eadily returned to the generator for a "reexpulsion," thus making the action automatic, and requiring
"The following named gentlemen have witnessed the exhibition of the above testa, and may be referred to for the correctness of this statement: Charles H. Haswell, civil and marine engineer, New York city, and formerly Engineer-in Chief, U. S. N. ; William W. W. Wood, Chief of Bureau o Steam Engineering, U. S. N., Washington, D. C.; S. Par rish, gas engineer, Jarsey City, N. J. ; Joseph Patten, engi neer, Elizabeth, N. J.; F. Glocker, machinist, Philadelphia, Pa. ; William Boeckel, machinist, Philadelphia, Pa."
In connection with the foregoing statement, a professional report is given in the pamphlet, by Mr. Haswell, one of the referees mentioned above. He certifies, as the results two actual working trials of the invention, as follows:
"Mr. Keely developed a cold vapor of a density that enabled it, when admitted to a cylinder having a piston $1 \frac{1}{16}$ inches in diameter, to raise a weight of 150 lbs . suspended from a compound lever, connected as 1 to 42 , which, with the weight of the lever and the friction due to the absence of a knife edge or rotating joint, was fully equal to an energy of $7,800 \mathrm{lbs}$. per square inch."
"That the vapor under the piston had expansive energy. That the temperature of the vapor reservoir and of the vapor itself did not exceed that of the surrounding air. Tha to operate a 45 horse power engine, a supply of the vapor of $793 \frac{\mathrm{z}}{\mathrm{z}}$ cubic feet per minute, at $7,680 \mathrm{lbs}$. per equare inch, would be required. That the inventor alleges that, by the introcuction within the apparatus of a very small volume of water, he can generate a vapor having an expansive energy of from 1 to 20,000 lbs. per square inch in the brief period of a few seconds; the only obstacle to the generation of this vapor in great volume being the capacity of materials to re tain it without rupture. That it is proposed to reduce the great pressure above mentioned by allowing the vapor to ex pand into an intermediate chamber, from which pipes wil lead the vapor, which may then be employed in lieu of steam in ordinary steam engines, the use of steam boilers and the consumption of fuel being no longer necessary.'
We consider it very kind in Chief Engineer Wood, Mr. Has well, Mr. Parrish, and their associate mechanicians, to serv as referees for this peculiar invention. In the absence of euch capable referees, the public in general, and perhaps the investing capitalists in particular, might have looked apon the scheme in the manner
muggl from beginning to end.
Jugglery has a bewitching influence upon some minds The learned Dr. William Crookes, of London, certified that the lever of his weighing machine was raised when the spiritual medium, Home, simply pointed his finger at it. [See engraving, Scientific American, 1871.] Several of th Doctor's associates, eminent people, corroborated the story. Mr. Haswell certifies that it was cold vapor, having a pres sure of 7,860 lbs. to the inch, developed by Keely, that lift ed his (Haswell's) lever. Home's trick being simpler we conder it the better of the two.
Among Mr. Keely's most recent predecessors in the "new motor" line was Paine, with his electric engine of 1871-2 Faraday said, you know, that every drop of water contains force elements equal to a streak of lightning. Paine developed this force by means of water, adding, however, a lit-
tle acid and zinc. With a two quart cup, Paine claimed tle acid and zinc. With a two quart cup, Paine claimed
to be able to generate power enough to drive vessels of the largest class across the ocean at the highest velocity. But he required a brand new engine in every case, whereas Keely will use the existing steam engines.
We have before us the claims of still another aspirant for "new motor" fame. He is an unsophisticated genius from Virginia. He, too, has read aboutthe Faradaic drop of water, and, like Keely, brings out the power by means of a mechanical device-a pendulum. A child may swing a pen dulum of great weight. The pendulum works an air pump which compresses air to twenty thousand pounds per square inch if need be. Thereafter a small portion of the air or vapor is used to maintain the swinging of the pendulum, Whive an remainder of the gigantine Keely plan.
drive
It is barely possible that the capitalists who have been disappointed in obtaining shares in the "Keely Motor" might meet with better success in applying for the Pendulum stock But should this likewise prove to be all taken, we are confident that Mr. Paine will be able to supply them. The reason we think so is because he is so kind-hearted, finding it less
difflicult to make new shares than to refuse to sell those on hand.

## THE OREMATION QUESTION.

The question of the disposition of the dead by burning the bodies, after the manner of the ancients, is a subject which has for some years past been under discussion in the scientific circles of Europe. Various processes have been devised as substitutes for inhumation, among others petrifaction and preserving in antiseptic solutions; but in the end, it appears that the total disaggregation of the body by cremation has been considered and announced by many of the ablest foreign savapts as the proper and indeed only way of avoiding the noxious effects resulting from the natural changes in the thopsands of human remains buried in the neighborhood of ekly populated localities. Taking its origin in Europe, movement during the last few months has, under the inuence of Sir Henry Thompson and other eminent scientific ruthorities, who have strongly advocated its principles, taken a new life and has rapidly spread over the continent. The
it to no small extent. At Zurich recently, 2,000 persons subscribed to an association having the burning of the dead as its sole object. At Basle, the orthodox clergymen pubiicly announced their approval of the movement,and in Germany a new apparatus for carrying out the operation of incineration has been invented and advertised. Moreimportant than this to us is the wide spread discussion which the subject has evoked at the present time also in this country. A society has already been formed in New York city, including among its members Mr. Henry Bergh, Drs. Sexton, Lorilliard, and J. W. S. Arnold, with many other well known citizens, for the purposes of promoting cremation and securing its practi cal application, and columns of the daily journals are given ap to correspondence and the views of the people upon the advantages and disadvantages of the system.
The reader unversed in the process, which it is proposed to substitute for slow moldering in the grave, will naturally hink of the ancient pyre and probably suppose that it is the ntention of the advocates of the plan to burn the bodies upon huge piles of variously scented wood, after the Greek or Roman fashion. Little would be gained in an eethetic or ven a sanitary point of view if such were the system, for the gases and fumes evolved would be far from healthy. The body of the poet Shelley was thus destroyed, and his biogra pher tells us that, so far from being the beautiful and poetic rite intended, the process was a very disagreeable and nauseous operation. Science profides a better plan for re ducing "ashes to ashes" in the apparatus especially devised by Professor Brunetti for the purpose, and by that invento recently described in the French Revue Scientifique. Afte having made several experiments on the human subject, in which the bodies were burned in the retorts of gas manufac ories, in closed receptacles, and with free access of air, Pro fessor Brunstti finds that an oblong furnace of fireproof brick is required, having 10 holes below, by means of which the intensity of the fire can be regulated. The upper part of this is hollowed to receive the coffln,over which a domed cover is placed,by which the flames as in a reverbatory furnace, may be directed upon the body. Within the cotin is a metal sup port or table on which the body reste, fixed by thick iron wire The operation embraces three periods: the heating of th body, the spontaneous combustion, and the calcination of the bones. During the first period,and about half an hour afte the pile of wood in the furnace has been lighted, the com bustion of the body commences. If the wood has been well arranged, two hours suffice to produce complete carboniza. tion. During the third period, the air holes being opened he carbonized mass is collected and placed upon a fresh plate and the heat is urged to the utmost, a fresh supply of wood being inserted. By means of this arrangement, at the expense of about 150 pounds of wood, complete incrematio may be effected in two hours. When the furnace has cooled the cinders and bones are collected and deposited in a funeral urn.
So far as sanitary benefit to the people is concerned, we can not but think the arguments of the advocates of cremation are cogent and forcible. It is well known that numbers have been rendered ill by water from springs and wells which have become contaminated by the near proximity of grave yards, and it is also a fact that there is a miasm arising from these receptacles which, as is universally recognized, ren ders their presence in crowded localities dangerous to health We do not see the ground of the assertion that by burial
the fertiliz:ng properties of the bodies are lost to the earth, the fertilizing properties of the bodies are lost to the earth,
for it seems to us that they are in as good a condition for ab ior it seems to us that they are in as good a condition for ab sorption as if eprinkled in the form of ashes over the surface, Neither can we incline to the belief, that by adopting crema tion, a point of economy will be gained, In avoiding the expensive paraphernalia of modern funerals, since the latter are governed purely by the dictates of faehion, and that fickle individual would speedily make the jeweled urn as costly an affair as the sculptured stone.
Anything which seeks to subvert a settled popular custom strengthened not only by long usage but by a prejudice growing out of a religious feeling, presente, however, at best a doubtful prospect of success. There is not a person, we may safely say, who, when the horrors of possible living burial,the slow decomposition,and the changes of the form of a loved one to a loathsome thing, to poison the health of the living, are laid before him, will not admit that the closed urnace, the pure fire flame, and the final handful of dry clean changeless ashes are much the better of the two means of disposition ; but his admission in the end will be found to apply to everybody in the world except himself and his family. It is a question of the heart in the end, not of the mind. Science, cold and passionless, may point out the bet ter way; but if its adoption is to tear wider the wounds caused by separation from those we love, no amount of reasoning will induce us to follow it. A husband may give his wife, a mother her child, into the embraces of the earth, and endure the keenest sufferings as the dirt and stone rattle on the coffn lid; but this act, revolting as it may be,is connected in the imagination with the highest and holiest of thoughtsthe hereafter. We may bury those nearest to us in our own bit of ground; we may imagine that their forms remain where we put them,and we may tend the flowers which bloom over their resting places as messengers from them to us. All this we can do: but there are few, we think, who would have the heart to hand his dead child or wife to a public official to be burned, or would care to see the ashes of his ancestors scattered over the earth as manure.

Postal cards are so extremely popular in this country that, although it is not long sinco they were introduced, the normous number of one hundred millions have been printed aud issued.

South African Diamonds.
Hon. Theophilus Shepstonehas pointed out that Africa, south of the equator, consists of a great central, irregularly shaped basin, the outer edge of which varies in hight from 4,000 to 10,000 feet above the level of sea, and that through this rim the Orange River to the southwest, and the Limpopo River to the northeast, cut their way. It is near the exit River to the northeast, cut their way. It is near the exit
of the former, from!the enormous basin, that the diamond fields of the former, from the enormous basin, that the diamond fields
lie, while gold in large quantities is being obtained from the northeastern district. The author of this paper conjectures that this basin is the dry bed of an enormousinland sea, and that the diamonds which are found in it are formed by carbonic acid gas, ejected by the action of subterranean heat through fissures in the earth's surface, into the bed of the dried-up sea, the water of which was sufficiently deep to imprison and liquefy the gas after its evolution. The discovery of the process by which this liquid gas became crystallized, of the process by which this liquid gas became crystalized,
whether by electric or magnetic current, or by the potent inWhether by electric or magnetic current, or by the potent in-
fluence of iron in some of its numerous forms, must be left fluence of iron in some of its num
to future scientific investigations.
Dr. Robert Mann, late Superintendent of Education in the Colony of Natal, states that, since the serious working of the diamond fields in 1871, large numbers of diamonds had been
obtained, and it was estimated that in 1872 there were no less obtained, and it was estimated that in 1872 there were no less 20,000 miners engaged in searching for them. So large had been the yield that a very material diminution had been brought about in the value of the larger gems in the home mar-
ket, and the diggers are now leaving the diamond fields for ket, and the diggers are now leaving the diamond fields for
the more profitable northeastern gold fields. The result of the discovery of these fields has been to develop South African commercial enterprize, and to civilize the wild tribes in that part of the continent.
Mr. Sopen, a diamond merchant, states that the number of diamonds of the purest water received from the Cape was very small, not amounting, on the whole, to more than two or three per cent, while of ten carat stones not one in 10,000 was perfect. In consequence of the large quantity of second class stones received from the Cape, such gems were now sixty or seventy per cent cheaper than they were three years ago. Stones which some time since would have realised $\$ 7,500$ would now only fetch $\$ 1,000$. The îrst class diamonds, however, were rather dearer than formerly

## IMPROVED PORTABLE OILER.

Our engraving illustrates a novel combination of an oiler with a pair of tongs, in such a manner that, by compressing the tongs, the oiler will be turned so as to bring its spout downward. The handles $f$ the tongs are of sufcient length to enable person to reach jour. al boxes overhead withut the necessity of a tep ladder. In the cenir of the flat sides of be oil can are secured surnals, one of which 3 simply pivoted in an rm of the tongs, while re other, $A$, is made ong and with a quarter urn twist. This, playgg in a slot in the other tw of the tongs, gives he oiler a quarter turn Then the former are
ompressed. After the ompressed. After the
iws are brought togeth$r$ so as to meet the ide of the can, further ressure squeezes the il, and this is coninued until the handles re freed, when the pring, placed at $B$, ushes the jaws apart, nd thereby causes the
iler to return to its upright position. The wire
pin or point, $C$, is designed for picking out the holes in boxes before oiling. This, when the tongs are compressed, turns around out of the way. This ingenious device was pe.tented by Mr. Gabriel W. Crossley, of Cleveland, Ohio.

## Mechanical stokers.

Contrivances for mechanical stoking appear to be among the most promising devices for economizing fuel. The attempts to supply an automatic feed for furnaces are usually, and perhaps wisely, imitations of the hand method, which is in the main so good that, whenever volumes of smoke are perceived issuing from a chimney, it may bo inferred that the stoker is somewhat in fault.
The patent mechanical stoker of Mr. Dillwyn Smith, illustrated herewith, is, like the others, an attempt to work the hand-stoking method by mechanical means. A hopper machine, known as Standley's, was in use forty years ago, and was considered to act well; but was so complicated in its parts that, owing to the rough nature of the material with which it had to deal, it was liable to continually get out of order. Mr. Smith claims to have entirely overcome these difficulties in his machine. The first-object which he seeks to attain is the saving of coai. The first step towards this is by regular distribution of the fuel, which is brought from the hopper by a screw, and falls upon a pair of fans running at a high speed, which project it over the fire and spread it
with remarkable evenness. Consequent upon this regular feed, the gases, which are usually lost and go up the chimney as smoke, are consumed. Not the least advantage of improved methods of stoking is the boon of freedom from the dense smoke which now hangs over our manufacturing towns, especially when this now worse than useless subtance is turned to profitable account. Another source of oconomy in fuel is found in the rocking bars supplied with the machine, which so far do away with the opening of the fre doors that, in some boilers, the doors are only opened when the works are stopped for meals.
From experiments with measured coal and water the results on land are stated to be, as contrasted with ordinary Cornish boilers with specially good hand firing, a saving of

from ten to twelve per cent by the use of this machine, apart from the avoidance of the smoke nuisance, and the saving to the boiler, and of labor to the fireman.
But beyond its value upon land, it is even of more impor. tance in its application to steamers, especially those which sail to tropical climates. A Astrong recommendation of these mechanical appliances is the fact that, by their use, the heat in the stokehole on board the Lisboness, under the equator, in the stokehole on board the Lisboness, under the equator,
was reduced by thirty degrees, and that this steaker made a faster run with six firesthen she had ever done previously with eight. Thesaving in the cost of fuel alone is, in this case, alleged to have been 80 per cent. Anything which promises so favorably as this must be well worthy of the serious consideration of all steamship owners, especially as decrease of stokers' labor to the extent of 70 per cent is also recorded in favor of the machine.
In mechanical, as in hand stoking, there are three principal points-a regular supply of fuel, its equable distribution over the bars, and a very carefully adjusted supply of air. Each of these is so intimately dependent upqn the othertwo hat all three must be effected together if the problem which mechanical stokers attack is to be solved at all. Mr. Smith's seems to be a praiseworthy attempt to deal with it, and the ecorded performances of his machine appear to be very sa-tisfactory.-Iron.

## Labor Legislation in California.

The Legislature of California recently passed a bill provi ding that no conductor ordriver of a street car should bs compelled to labor more than twelve hours a day without extra pay. Governor Booth vetoed the bill, giving his reasons in the following language:
"I am clearly of opinion that [under the operation of the inexorable law of supply and demand the wages of labor cannot be fixed by legislative enactment; and that the practical effect of this bill would be to reduce wages in the two instances specified, in the same proportion as the hours are reduced, and compel an additional reduction by the friction reduced, and compel an additional reduction by the friction
t creates. The laborer, too, of ten has to sell Monday's labor it creates. The laborer, too, of ten has to sell Monday's labor
to buy Tuesday's bread, and every artificial obstruction in the sale of Monday's labor only tends to make the bread of Tuesday harder and scantier. The bill in effect says to the man seeking employment as driver or conductor: Whatever may be your necessities or hopes, you shall not labor for one employer more than twelve hours per day. All occupations are equally open to drivers and conductors with all other men. Can the law make a better contract for them than they can make for themselves? If a man prefers to work in his vocation fifteen hours for $\$ 2.50$, rather than twelve hours for $\$ 2$, is the law which prevents him a substantial kindness to him? That the necessity which lies behind such a choice,or which induces him to make either contract, is a hardship is too true. If the law could remove that, it would indeed be blessed. But, since it cannot, does not attempt it, cannot even judge of its extent in individual cases, is it wise to prevent the individual from making his own choice in his individual case? No man will accept employment formore than twelve hours per day, except to escape from some greater hardship. Is it right to close this avenue of escape-to cut off his right to choose for himself between want in his family and extreme toil for himself? The classes this bill seeks to benefit would hardly admit that there was anything in the nature of their employment to differentiate it from that of all other free labor, and assimilate it to that of servitude, which the law must of necessity regulate in the absence of
free agency. The fact that any man in a land of plenty is compelled to work more than twelve hours a day to procure bread for his family is a sad commentary upon our civilizaticn and society-the more sad when we know there are hun. dreds of applicants for so poor a boon as the opportunity to do so. The great evil is not that a few men in one employ ment do this, but that there are so many who would be glad to. If the necessity for laboring for disproportionate pay, or of devoting the natural hours of rest and recreation to severe toil, were peculiar to the classes named, the law might possibly modify the wrong: or, it is more reasonable to think, society itself would soon supply a complete remedy. It is because the same unadjusted conflict between the right and wrong is"active and clearly visible, in many other occu. pations, that legislation, looking only to one feature of a vast system, is of questionable power. To remember the car driver and forget the seamstress; to pity and provide for the conductor and forget the many who have equal claims to consideration; to guard one class against oppression and neg. lect a larger number, in whose tacit demands for relief precisely the same principle is involved, is to invest the statute with a character which is partial, and is to make the law invidious. Overwork and underpay are common factors in a great problem; they constitute an evil in all countries. This great central evil there is no attempt to reach. In the sharp competitions of society, in the relations between capital and labor, which are the outgrowth of our imperfect civilization, perhaps any attempt to reach it by direct legislation would be futile. It is a part of the theory of our government that its adult citizens are free agents; that they can select their employments and judge of their abilities and necessities to better advantage for themselves than the State can do for them. Deeply convinced that this is in contravention of that theory, and that it, in practical effect, would be an injury to the class it seeks to benefit, I am constrained to return it without approval."

## IMPROVED COMBINATION SCISSORS,

Mr. Casper Van Hoosen, of New York city, is the inventor of the novel form of scissors represented in the accompanying engraving, and has provided a device which, we imagine, will be found a quite convenient addition to the work basket. At the inner edges of the blades, and near the pivot of the same, are formed curved slots, which cause said edges to terminate in sharp corners. The slot on the broad blade is shouldered at $A$, and the projection thus formed, when the scissors are sufficiently closed, strikes against the stop, B, which is a simple screw readily turned in and out of a nut. $C$ is a stop which slides, and is held by friction upon the edge of one slot. as shown, the latter being suitably graduated.
The object of this arrangement is to enable a number of button hole slits to be cut with uniformity and accuracy after the scissors are once adjusted. The operation
is as follows: The blades is as follows: The blades
being widely opened, the cloth is carried between qhem, and its edge led into the curved slot. The distance from the sharp inner lower corners of the blades to the stop, $C$, measures the space of the inner end of the but-
 ton hole from the edge of the cloth, and conse quently, by moving the stop, C, along its slot, this space tan be altered at will. The length of the button hole is governed by the stop, B, which is screwed in more or less, so that the shoulder, A, takes against it sooner or later. The proper adjustments once made, it is evident that the operator can cut as many slits as rapidly as he chooses, and all will be of the same size ; and by noting the position of the stop, C , with reference to the divisions on the slot, and also that of the angle formed by the blades when brought as near together as the stop, B, will allow, with reference to the markings on the broad blade, the same adjustment may accurately be remade at any time. Upon the ends of the handles are formed two jaws, so located that, when the handles are brought together, a pair of pliers or tweezers is formed.

Cement for Aquaria.-An adhesive cement for aquaria may be made, according to Klein, by mixing equal parts of flowers of sulphur, pulverized sal ammoniac, and iron filings. with good linseed oil varnish, and then adding enough of pure white lead to form a firm, easily worked mass.

Dr. Hanbury Smith writes to say that our mention of a gallon of water as containing $277 \cdot 274$ cubic inches is an error. The English imperial gallon is $277 \cdot 274$ inches, and is about one fifth more than the American gallon, which is $\epsilon x$ actly 231 cubic inches capacity.

## aN INSTANTANEOUS LIFE PRESERVING RAFT.

The history of recent marine catastrophes, such as those of the Atlantic, Northfleet, and Ville du Hapre, prove that vessels, after becoming severely injured, generally sink within half an hour. The unavoidable confusion which follows the occurrence of a sudden disaster renders such means of safety as the boats, which require care and some time to launch, of little value; but, on the other hand, devices which may beinstantaneously set afloat such as light rafts, would, if properly disposed about a vessel, be of the greatest efficiency in sa ving life. Thereare certain re quirements, however, which such apparatus must meet in order to be of sure utility in the time of need, and which may be summed up as follows: They must be of sufficient capacity to support,say, from 400 to 600 persons, so located as to necessitate no altera tions in the vessel or so as to in terfere with her management, perfectly accessible, and, finally, so applied to the side of the ship as, when afloat, to be readily reached by the passengers.
In the illustrations herewith given is represented a new form of "instantaneous raft," which appears to be of considerable value, judging from its general design, and which may be ar ranged in connection with steamers of the largest size. Our en gravings are drawn to the pro portions of the Ville de Pari and Pereire, both transatlantic steamers of heavy tunnage.
Fig. 1 shows the apparatus hanging from its davits, ready for use, and Fig. 2, the same afloat. A reservoir of strong sheet iron, containing 106 cubic feet of air compressed to 15 at mospheres, is placed in the en gine room, and kept always charged by means of the pump ordinarily used by divers in de scending to repair the bottom or screw. Tubes pass throug an expansion chamber, which is three fourths full of water, and discharge the air into the same through perforations in their sides, the blast finally escaping through a heavy iron pipe. The latter will be seen in the illustrations between the davits, as it extends up through the deck. It is filled with several cleats to allow of access to its outer extremity. This pipe, together with the reservoir and the expansion chamber, are carefully tarred inside or lined with rubber, so as to preclude any possible leakage. The column, $D$, is united by means of a strong screw sleeve, N , to the insufflation tube of a huge air mattress, $M$ (length 26 feet width 23 feet, and thick -as 20 inche which ness 20 inches), which is con ained rolled up in an envelop E (Fig. 1), and suspended like boat above the bulwarks. F F Fig. 2, are strips of wood se cured transversely across the upper side of the mattress, above which, again, is attached a cover or deck, P, of heavy canvas. To the latter is longitudinally se cured three flexible tubes, $G$ Fig. 2.
When the command is give to lower the raft, the crew, of about a dozen men, cast loose the cords, H , thus allowing the mattress to unroll and hang (by the screw sleeve, N ,) alongside the ship. While in this position, heavy iron rods are pushed int the tubes, $G$, thus holding the pparatus extended A turn or wo of the handles on the screw onnection, N , admits the from pipe, $D$, which speedily in fates the mattress. Another turn coses the connection and con fines the air, and one more twis disengages the screws, when the raft drops into the water. Her it is held by wire ropes, J, which are secured to rings which trave on the vertical stationary guys, S , thus retaining the raft close up to the ship's side. In the rail are made two ports, $V$, which afford ascess to the Jacob's ladder leading down to the raft. The latter is finally set adrift, after being manned, by $r \in$ moving the pega, $R$, which connect it with

the cords, T. The Revue Industrielle, to which journal we are indebted for our engravings, states that the device has been practically tested with considerable success. At the present day, when losses of ocean steamers are more than usually prevalent, such inventions are of especial and timely importance.

## Fig. 1.-INSTANTANEOUS LIFE PRESERVING RAFT.

 est ease.
ties of the owners of steamships.

## Wildess Electric Light.

The Comet, a British gunboat, has lately been fitted with one of Wilde's electric lights, whichoperates with great success. A recent trial showed that its power was immense, and that no boat could approach the light within a mile with-
he Comet, and with the beam of light brought to bear upon the bat, the Times newspaper could be read with the great

Mr. Wilde's apparatus consists of two parts-an electro magnetic induction machine for producing the electricity, and an arrangement for regulating the light produced by the current, and projecting it upon distant objects.

The electro-magnetic induction is founded upon a new and some what paradoxical principle dis covered by Mr. Wilde-that magnets and electric currents indefinitely weak can produce magnets and currents of indefinite strength. The machine con sists of a circular or cylindrical framing of cast iron, round the interior of which are arranged a number of eiectro magnets a equal angular distances from ach other A cast iron disk is mounted on a driving ahat run ing in bearings fitted to each ide of the framing, and carries number of armatures revolv ng before the electro magnets. A slight charge of magnetism imparted to the electro-mag nets before the machine is used or the first time, by transmitting momentary current through the wires surrounding the iron cores, or by touching their ex remities with the poles of a permanent magnet. This ini tial charge is al ways retained by the electro-magnets, and is the basis of the augmentations of the electricity and magnetism produced by the rotations of the armatures. As the armature revolve, they become slightly magnetized in their passages beween the poles of the electro magnets, generating weak cur ents in theinsulated wires surounding them. These current are transmitted, by means of a ommutator, through the wires surrounding the electro-mag
nets, so as to increase their magnetism until, by a series of actions and reactions of the armatures and electro-magnet on each other, the magnetism is exalted to the highest de ree of intensity and themost powerful currents of electri gree of intensit, and the mole duced is sufficient to sustain the power of the electro-mag nets, while the major portion of the current produces the light. The machine on board the Comet is 28 inches high 34 inches in length, and 21 inches in diameter. Its weigh is 11 cwt. About four bors power is required to drive it at a velocity of 600 revolutions per minute, and this driving powe is obtained on board the Come from the fly wheel of the small engine that raises and lowers the eighteen tun gun and its plat form. At this velocity the cur rent will fuse an iron wire 6 fee long and 005 inch in diameter and will burn carbons half an inch square. In this machine the alternating current is used for producing the light, past expe rience in lighthouse illumination having proved it to be greatly superior to the direct or continu ous current, since it has the im portant advantage of consuming the carbons equally, and thus al ways retains the luminous poin in the focus of the optical appa ratus used in connection with the machine. The alternatin current also dispenses with com mutators, and the destructive spark on the rubbing surfaces is also a voided when the light may be accidentally extinguished, or when the circuit becomes broken from any other cause. Copper wire conductors are laid from the machine along the Comet's deck, from the position of the machine over the engine room to the fore part of the vessel, for the transmission of the electric current to the apparatus where the light is regulated and projected from All the arrangements on boar the Comet, in this respect, have been made'to render the light available for naval purposes, whether as a torpedo boat detec tor or otherwise, and with thi triew a simple mechanical regu.
lator arrangement, worked by the hand, has been substituted for the delicate mechanism by which the carbon poles have hitherto been automatically adjusted. The carbons, as they consume, are made to approach each other by means of a right and a left handed screw, the screws being made to act independently of each other, so as to allow of the adjustment of the carbons to the focus of the optical apparatus used for projecting the light. The regulator, with its carbon points, is placed in the focus of a catadioptric lens, which parallelizes the divergent rays of the light into a single beam of great intensity. The lens, with the regulator, is pivoted horizontally and vertically on the top of a short iron column fixed on the forecastle balwarks of the Comet. The box fixed on the forecastle balwarks of the Comet. The box
holding the lens and regulator with the carbons is thus well holding the lens and regulator with the carbons is thus well
elevated above the bows of the vessel, and the beam of light, elevated above the bows of the vessel, and the beam of light,
by the action of a quick screw adjustment, may be directed to every part of the horizon, and cover any object within the vertical angle of its range. As the carbons only require regulating once in two or three minutes, this is effected by the man in charge without any interruption in the movements for directing the beam of light.
Mr. Wilde, in his official communications with the Admiralty, has estimated the cost of producing the light from his macline on board the Comet, exclusive of the driving power obtained from the vessel's engine room, at only 4 d . per hour.

## JAMES BOGARDUS

Mr. James Bogardus, an inventor celebrated both for the multiplicity and variety as well as the value of his productions, recently died in this city in the 75th year of his age. The record of his life is one of continuous labors repeatedly crowned with substantial success, of a versatile genius which devoted itself to the origination of devices in widely differing arts and industries, and finally of unremitting toil in the search for the new and useful, pursued even to the day of his death.

Born in the first year of this century, at Catskill, N. Y., Mr. Bogardus quite early in life developed a strong taste for invention, and while still a young man obtained the highest premium for an eight day, three wheel chronometer clock; subsequently he devised a complicated time piece without dial wheels. In 1828, however, he produced his first generally useful invention, the "ring flyer," still largely em. ployed in cotton-spinning machinery; this was followed by an excellent form of sugar grinding mlll, also now in use. The steel die of the first gold medal of the American Institute was cut by an engraving machine invented by Mr. Bogardus in 1831, about the time of his production of the transfer machine, now everywhere employed for printing bank notes from separate dies. In the following year he invented the first dry gas meter, and then modified his plans so as to produce an apparatus,for the same purpose, of totally different construction. In 1833 he patented a pencil case of ingeniously novel design. Being in England in 1836,he answered a challenge in the public prints by inventing an engraving machine which made not only an accurate facsimile of the head of Ariadne on a medal, but also engraved from the medal comic facial expressions. This engraved from the medal comic facial expressions. This
device was followed by an engine turning machine, and in device was followed by an engine turning machine, and in
1839 by his winning a prize of $\$ 2,000$, over 3,000 competitors, 1839 by his winning a prize of $\$ 2,000$, over 3,000 competitors,
for the best machine for making postage stamps. Mr. for the best machine for making postage stamps. Mr.
Bogardus' plan for the erection of iron edifices, as shown in his own faciory at the corner of Center and Duane streets in this city, has been largely adopted throughout the country.
The inventions of this remarkable man realized for him a large fortune, but the accession to wealth seemed to offer no inducement for him to remit his exertions. He was devising an apparatus for deep sea sounding at the time of his death.

## PREVENTION IN PLACE OF CURE.

President Barnard, in his late address befare the Health Ascocietion on: ? ovcasion of its meeting in this city, intiwiated clat the auv...ce of modern science was such that the physician would eventually find his occupation gone. The p sople would, it was considerad, as they advanced further in knowledge of natural laws, become more and more able to dispense with the doctor, and in brief would learn so to apply the "ounce of prevention" as to obviate the necessity of the "pound of cure." We do not agree in the view that the physician will ever bacome a useless member of society, for the simple reason that, instead of decreasing the share of his duties, the culture of preventive medicine-of the knowledge of how to prevent diseases as well as to curs them after
they are engendered-must tend to amplify and enlarge the they are engendered-must tend to amplify and enlarge the
same. His will bs the task, not merely to recognizg the forms of ills and endeavor to combat their effects, but to look into the future and, through the aid of circumstances of the present, predict possible evils and point out means of defense. Add to this the constantly increasing knowledge of drugs and their properties, of the wonderful relations of mind and body, of the nature and habits of disease, which Science is rapidly developing, and the physician of the future has before him not a narrower but a far wider field for the exer cise of his skill.

Preventive medicine," says Dr. Henry Bowditch, in an an admirable and exhaustive paper on the subject, which we find in the fifth annual report of the State of Massachusetts, " is the natural outgrowth of modern thought and re sources, stimulated by centuries of suffering and by the sons given us by Nature as to the posaibility of checking or preventing disease have culminated in the fact that the State uses its moral power and material resources toward preserving the health of its cltizens, As to how far the State may
thus exercise authority, there is a difference of opinion; but the views expressed in the paper before us (pointing out that the neglect of a city government to provide proper sewerage and the course of a common drunkard, both tending to disturb the public peace and the comfort of indi viduale, are alike crimes and should be considered as such in law),seem fraught with a deal of sound sense. The existence of vile deposits which overwhelm the inhabitants with a tainted atmosphere or the spread of a habit which strikes at the root of the physical, moral, and intellectual health of the people, are both producers of disease to the community which should be as sedulously guarded against as the visitation of a fever to the indiviaual, and the means used to defend the people from their
medicine.
In considering the best chances of a person having tendency to consumption arriving at a good old age after life of health, Dr. Bowditch discusees a few general topics and lays down a number of plain rules for sanitary guidance which are mainly generally applicable to every one. Under the subdivision of residence, the first point urged is that the cellar should be always dry. No possibility should exist of drinking water becoming contaminated by refuse; and hence for the latter, closely cencented stone, brick or vitrified tile drains should be used, while the supply for drinking should be brought to the house from some distant spring or pond. The dwelling is best located on an elevated knoll open to the south and west winds, but somewhat shielded from the north and east. There should be means of allow ing sunlight to enter every room. As regards temperature, about $70^{\circ}$ as a medium is the best, and this heat should be derived from open fire places connected with well constructed chimneys in every room.
With reference to clothing, the writer condemns sudden changes made in the spring of the year, and points out the well known objections to thin soled shoes, tight lacing, and low dresses. Bathing is recommended in moderation as a check to consumptive tendencies. Surf bathing, however, should be cautiously indulged in by all predisposed to pul-

Dr. Bowditch condemns very strongly the neglect of re creation common to Americans. Children naturally weak should be compelled to play in the open air, and business men should make it a rule to leave work for a certain perio In matters of education same to exercise or other relazation In matters of education among people showing the slightest
tendency toward consumption, it should be a steadfast law that the mind should be wholly subservient to the body's welfare.
The various kinds of physical exercise are considered by Dr. Bowditch in some detail. Walking, he befieves, is the best orm, and most generally applicable. It exercises the body better than any other method. The most favorable time is about midday in winter and in the morning and toward evening in summer. Late in the evening is less useful be cause of the liability to dampness and coldness in the absence of the sun's rays. Fast running,in the opinion of the writer is pernicious to consumptives; it produces violent motions of the heart and too rapid breathing, and consequently great tendency of blood to the lungs. As regards dancing, it is said that, at appropriate hours and for a proper length of
time, nothing can be better. It promotes grace and ease of motion and positive health, if used thus properly. Horse back exercise for consumptives is excellent, and in fact a remedy for the disease at its inception. An easy pacing or galloping horse is better than a hard, square,solid trotter, as the latter is apt to cause pains in the chest and undue fatigue. Driving for health should be in an open carriage the back should never be rolled up while the sides are erect because the draft thereby produced will be liable to cause a cold and consequent injury to the lungs.
Gymnastics, while increasing the power of the muscles,are of little advantage in warding off phthisis. Many atalwart gymnasts have been victims to consumption. The swinging of heavy clubs about the head cannot be recommended. Less coneume than that with the arms canses hommorrhage in those train on the heart and lungs, and it is questionable whether severe blows of the chest are ever of use. Bowling should be avoided by consumptives. Rowing tends to expand the chest, and, if no racing be undertaken, may prove of great value. Swimming should be used with great caution, as too
long a stop in the water is apt by itself to bring on consumption.
Dr. Bowditch,in conclusion,says thatif these resommenda tions, with others that might be added by any family physician could be thoroughly carried out by the patient during child hood, and by the man or woman when arrived at adult life many that will now die of consumption would escape that calamity.

## Cortegpoudeute.

The Analyzing Power of the Spectroscope. To the Editor of the Scientific American:
The science of spectrum analysis is not yet a hundred years old, but the results obtained in this short time are sur prising. The grandest principle evolved is, the uniformity of the elements composing the universe. The earths, metals, and gases, of which the planet on which we live is made up, and soen lound to be present in the sun and the fred stars of sunlight, several new metals have been discovered, whose presence in our world was not theretofore known. Some connection has also been found to exist between the apots
and glowing gas streams of thesun and electrical phenomena; although the subject has not been sufficiently studied for the laws governing this relation to be definitely established. When we think that, for many thousands of years, Nature bas set the rainbow in the heavens, as a constantly recurring hint of the great laws of thelight shut up in the tiny globules of water, it seems strange that man did not sooner grasp at some of this half concealed knowledge. But, it is not of the results of spectrum analysis of which $I$ wish to speak, but of the minute analyzing powers of the instrument itself.
The most interesting of these is the power of indicating the size, shape, and motion of the gas flames of the sun. From time to time, streams of glowing gas shoot out from the surface of the sun, to the hight sometimes of one hundred thousand miles, and with a rapidity of one hundred miles or more in a second of time. They may have also a. lateral motion, and develope into the most fantastic shapes. It is possible to measure with accuracy these swift twistings and turnings, to draw their contours,and to note not only the rate of velocity but alao the angles which they make with the surface of the sun.
Another interesting power of this instrument is that of denoting the presence of extremely minute quantities of abstances. The most common of all known substances is sodium, the base of common salt. Indeed so universally distributed is it that great difficulty is experienced in obtainng a spectrum without the characteristic lines of this metal. it will not be wondered at when we learn that the spectroscope will demonstrate the presence of so small a quantity as one fourteen millionth of a milligramme,or 1400000000 of gramme.
There are three other metals of which the spectroscope has the susceptibility of demonstrating even smaller quantities, namely, lithium, thallium, and stronthium, the visible quantities being one forty,eighty, and one hundred millionths of a milligramms respectively.
It must not be supposed that the instrument is employed only in astronomical and chemical science. In many me chanical arts, it has become useful, as for instance in the preparation of dyes. It comes to the assistance of the public analyzer in testing the purity of wine, beer, cheese, butter, atc. It has opened an important field of research to the physician, diagnosing for him the condition of the tissues and luids of the human body. It is moreover an aid in the administration of justice, in detecting the presence of blood or of poison.
In conclusion, let me give, as an illustration of its accur ate and minute power, the examination of human blood. Blood may be burned, treated with acid, dried or washed or ept for an indefinite period of time, and yet this instrument will detect the presence of the constituents of the blood in he substance that remains.
Moreover the fresh blood globules ara so minute that, if hree thousand of them be placed in a row, they will measure barely an inch in length : yet one half of one of these globules or one six-thousandth of an inch of blood, may be detected by the spectroscope.

S, H. C., M. D.

## Polishing a Parabolic Mirror.

To the Eiditor of the Scientific American:
Having read with much interest, in your recent issues, an ccount of a proposed plan for constructing a mammoth te escope, and hering heard it stated that it would be a dittcult matter to turn and polish a parabolic mirror of a large size, I inclese a drawing of a device which suggests itself to me as adapted to the requirements of the case; and I think it should be brought to the notice of any parties contemplating the erection of such a telescope:
$A$ is the mirror, $B$ a bar, extending across the top of the mirror and having lugs, $b b$; C is a guide, having the exact curve to which it is designed to turn the mirror, and on which lug, on the journal, $D$, slides; $E$ is the tool (which is de-

achable), from which the shaft extends upwards through the journal, $D$, above which there is a collar. Fis a pulley, from which the shaft receives its motion, the belt running at right angles to the plane of action of the shaft; $F^{\prime}$ is a jour al, turning in a eocket in the bar.
It is clear that, ly imparting to the shaft a high velocity, and then rocking it slowly from side to side, at the same time slowly revolving the mirror, the whole of the surface will be traversed by the tool, and will have the exact curve of the guide, C. Probably the best mode of imparting the oscillating motion to the shaft would be by extending it above the pulley, attaching a pivoted rod at the top, and operating it by hand.
Philadelphia, Pa.
We see, in the London Building Neoos, that it is propsesed to construct a railway from Naples to the crater of Mount Vesuvius. The journey will be made in an hour and a quarter, and the line is to cost six or eight hundred thousand dollars. One of the promoters is said 'to be enabled, by his study of he subject, to guarantee the safety of the passengers in the ovent of an eruption."

STRAIN DIAGRAM8-WHAT THEY ARE AND WHAT THEY TELL US.
by profzsooz в. н. thunstor.
A strain diagram is a graphical representation of the va riation, of the resistance of a specimen of any material, with the change of form which occurs when it is strained by external forces. It is usually a curve, sometinues of regular form, but generally of an irregular shape. Were the material always perfectly homogeneous, and absolutely uniform throughout, in composition, texture, and in the distribution of the molecular forces, this diagram would be a smooth graceful, regular curve; but every variation from homoge nousness and uniformity, in any of its properties, must affect the curve, and, as a strain diagram, it becomes a record from which an accomplished obs arver should be able to deduce the true physical character, and sometimes even the chemical nature, of the material represented.
Strain diagrams of the material of construction are bes obtained, where accuracy and completeness of information are desirable, by means of an autographic recording appara tus, attached to a machine for testing by torsion, in the man ner adopted by the writer and already several times referre to in the columns of the Scientific American ; but, in th works of Rodman, Captain King, and othere, may be found strain diagrams produced by plotting carefully the results of experiments made in the ordinary manner. The finest curves yet published are to be found in the account of the experi ments of the Swedish Royal Commission, written by K. Styffe, of the School of Technology at Stockholm
Referring to the illustrated article published in the ScIEN tific American of January $1^{\prime}$, the reader will readily see how to construct such diagrams for himself. To secure satisfactory results, however, great care must be taken, in ob servation and record of the first effects of the applied force, since the most valuable indications are often obtained from that part which represents the first six or eight degrees of $t$ wist.

Fig. 1 represents this portion of the strain diagrams pro duced at the Stevens Institute of Technology, by specimen of iron and other metals, of stan lard size, five eighths inch diameter and one inch long, in the reduced part, by the au

graphic machine. It will be seen that they are so formed that each point of the curve is so situat $=$ d that its hightabove the base line (that is its ordinate, as it is called), measures the force which strains the piece to a degree which is proportional to the distance of the point from the right hand border of the diagram, that is to say, the latter distance is the abscissa of the given point.
Space will not permit an extended explanation of the methods of determination of the meaning of each peculiarity of the curve, or of the operations of verification, as they are described in sufficient detail in the account of the research published elsewhere.* It is only necessary to state here that an early acquired familiarity with steam engine indicator cards and long practicein their interpretation, probably first prompted the critical examination of these diagrams; and, as with the indicator diagrams, careful observation and comparison led to interesting and useful dedactions as to their meaning.
The curves, $\mathrm{A} \mathrm{A}^{\prime}$ and E , are the regular lines, parabolic in form, which are given by metals of homogeneous character. A and $\mathrm{A}^{\prime}$ are curved from the start, and are thus known to be the strain diagrams of inelastic as well as homogeneous metals. The line, E, which is at first straight and inclined, is, by that fact, known to be produced by an elastic material, while the regularity and smoothness of the succeeding portion of the curve indicates homogeneousness of structure.
These diagrams are respectively those of forged and cast copper, and of the beautiful specimen of iron described and pictured as No. 22 in the article of January 17. B, in Fig. 1 , is similar in its general character to $A$ and $A^{\prime}$. It is the beginning of the strain diagram of a soft bronze.
Diagrams C and D are so different from the preceding that the most careless observer notices their peculiarities, and can recognize the distinction, not only between these curves and $\mathrm{A}, \mathrm{B}$, and E , but also between themselves. C rises in a curve convex toward the base, turns a sharp corner at $e$, runs nearly horizontally some distance, and finally pursues a course which would be seen to be parabolic, could the remainder be shown. D rises more nearly vertically, but curves slightly to the left, turns a well marked corner also, and then also
runs a little way, almost horizontally, before resuming the runs a little way, almost horizontally, before resuming the
There is a strong resemblance, and yet an evident differ ence here. The diagrams are those of two well known brands of iron, good specimens both.


The striking peculiarity of C , its reversed curvature, i supposed to be produced by the existence, in considerable amount, of the internal strain of which the effects were de cribed in the Scientific American of April 11, and which is there described as a lack of homogeneousness as to strain Were there not an appreciable amount of internal strain, this portion of the line would present the appearance seen in D and in E, and would be parallel to the elasticity line, $l l$. Th degree of this reversed curvature, and the deviation from parallelism with $l l$, shows how much the metal is affecte by this strain. It is noticeable that $C$ is evidently weak or than $D$, which fact is, not improbably, a consequence, and perhaps a measure, of the ill effect of the observed fault.
After the piece has been strained to $l$, and the force pro ducing distortion is first removed and then renewed, pro ducing the double line, $l l$, just referred to as the elasticit line, much of this internal strain has been relieved by the mare stretching of fibers, and $l l$ is thus nearly made a straigh ine. It is now also seen that the latter line indicates mor correctly the real elasticity of the material than does th initial part of the line up to $e$, where these internal forces interfere with elastic properties. We therefore always de termine the elasticity of the material by forming lines lik $l$. One of the important discoveries which has followe these investigations is that the elasticity of the metal re mains th
The point, $e$, at which the line turns and becomes prett nearly horizontal, indicates where the change of form becomes considerable with comparatively small accessions of force, and where theset becomes approximately proportional to the amount of distortion, and it is called the limit of elasticity. In A, $A^{\prime}$, and B, it is not well marked; in E , it is more readily determined, and, in C, D, F, and G, it is well marked and is easily determined.
This is generally the point which it is considered most im portant to determine. Many experienced engineers think $i$ more important to know the resistance at the limit of elasticity than even the ultimate strength of the material. It is extremely difficult to determine it accurately by the usual methods of test. Here, it is so well shown that, except with a few hard and, at the same time, very homogeneous ma terials, the most casual inspection of the strain diagram re veals it.
No materials should ever be subjected, in permanen structures, to stresses nearly approaching this elastic limit A factor of safety, with reference to this point, of one half, that is straining the material to one half its elastic limit of resistance, is considered good practice.
Passing the elastic limit, the considerable deviation from the parabolic curve, and the consequent approach to the hori zontal, which is observed so plainly in the strain diagrams C and $D$, and is less evident in $F$, and still less in $G$, shows lack of another kind of homogeneousness, a defect of homo geneousness in structure. This is produced in irons, like and D , by the presence of cinder, which cannot be perfectly expelled by the puddler, or by the subsequent processes of squeezing or hammering and rolling, and which produces the well known appearance of fiber. In $E$, this cinder bas been so perfectly expelled, and the metal, by thorough and careful working, has been so purified, that no cinder is indi cated, and the fracture, as already illustrated in an earlie article, shows excellent quality of metal and no fiber.
In the low steels, of which $F$ and $G$ are parts of the strain diagrams, this same want of homogeneousness occurs but usually in a far less degree, in consequence of the ex istence of porosity in the ingot. In the rolling mill these pores are drawn out into very minute lin s or channels of microscopic dimensions, producing the same effect upon the mechanical properties of the metal as is produced by the fiber in iron.
Comparing the several curves, we see that the line, $C$, is rom a slightly better worked iron than $D$, although work ng cold is probably the cause of the internal strain in $C$ that E is almost perfect in both kinds of homogeneousness that the Bessemer steel, $F$, is from a more porous ingo han the higher Siemens-Martin steel, $G$.
We see that the copper and bronze, of which $A, A^{\prime}$, and $B$ are strain diagrams, are apparently perfectly homogeneous n structure as well as free frominternal strain
Comparing the angle made with the vertical by the part of ach curve lying beneath the elastic limit $e$, we find that, in order of stiffiness, they stand: D, F, E, C, and lastly $A, B, A^{\prime}$, A. In elastic resistance, the order is: $C, F, E, D, C, B, A^{\prime}, A$. Could we follow the whole extent of each diagram,we should and this last to be also the order of ultimate resistance to upture. As a general rule, the ultimate strength is prstty early proportional to the resistance at the elastic limit.
Thus, by constructing on paper the curves which will represent accurately the results of experiments made in the ways already described, we obtain strain diagrams from which we deduce useful information respecting nearly every valuable property of the material. The length of this article orbids entering upon an explanation of the method of determining the ductility of the material and its power of resisting hock, or describing the way in which the action of time, the offects of tempering, and other interesting subjects have been nvestigated.
It will be seen, by inspecting the figure, that the horizontal scale is one of degree, or of elongation; the vertical scale a the right is one of moments of torsion; and that on the left an approximate scale of tension in pounds of stress per quare inch of section on those lines of particles which are
most strained. Stevenin Institute of Thotinology.

## sCIENTIFIC AND PRACTICAL INFORMATION.

## CURIOUS PROPERTY OF TARTARIC ACID.

M. Pasteur, in the course of his investigations, has noted curious splitting of racemic acid into two tartaric acids, identical as to their composition, but one of which rotates the plane of polarization to the right, and the other to the left. M. Bertholdy has recently made some interesting researchesints his subject, with regard to the quantity of heat evolved. He ind sthat the right acid dissolved in water absorbs $3 \cdot 275$, and he left acid, $3 \times 270$ calorific units. Racemic acid, on the other hand, absorbs 5.420 units. The combination of this same cid with two equivalents of water disengages 6.900 urits. t results that the solution of this hydrate in water repreents a movement of heat equal to the difference of the two preceding numbers, or $1 \cdot 480$ units. Now it is curious to note hat this last exactly coincides with the number recently ound by M. Desains as representing the heat of melting ce, and hence the odd result may bestated, that if solid tararic acid were united with solid water, or ice, there would be no disengagement of heat.

## TROILITE.

The above name is given to a sulphuret of iron largely ound in meteorites. The majority of mineralogists have considered the substance as a protosulphuret of iron, but such, according to a note recently presented to the French Academy of Sciences by M. Daubrée, appears not to be itf true constitution. The proper formula is said to be $\mathrm{Fe}_{7} \mathrm{~S}_{8}$ There is a variety of mineral known as magnetic pyrites, or prothene, found at Horbach, in Baden, in specimens identical both in composition and density, with those which fall from interplanetary spaces. This conclusion is strengthened by hemical analysis, as the protosulphurets possess certain properties which render them readily recognized. Under he influence, for example, of bisulphate of potash, the py rothene gives off sulphuretted hydrogen. This the meteoric mineral does not do.

The French Bishop of Canton has just sent to the Jardin d Acclimatation, at Paris, a plant whose tlower changes colo hree times a day. It is spoken of as another wonderfu vidence of Chinese art in leading Nature out of her cus tomary paths. It appears, however, that it is, if not the same, at least not more remarkable than a natural flora freak found in Southern Australia. It is a beautiful flower similar to our well known morning glory, with five streaks of color on its bell-shaped calyx. In the early morning the color streaks are pale blue. Toward noon they turn to a rich purple tint, which changes to a light pink during the after noon. As the day declines the culor fades, disappearing en tirely after sunset, when the flower closes and dies.

## How Sea Lions Enjoy Lire.

Charles Nordhoff, in the April number of Harpers', has his interesting account of the habits of sea lions:
It is an extraordinary, interesting sight to see the marine monsters, many of them bigger than an ox, at play in the urf, and to watch the superb skill with which they know how to control their own motions when a huge wave seizes hem and seems likely to dash them in pieces against the rocke. They love to lie in the sun upon the bare and warm rocks and here they sleep, crowded together, and lying upon each other in inextricable confusion. The bigger the animal the greater his ambition appears to be to climb to the highes ummit; and when a huge, slimy beast bas, with infinite quirming, attained a solitary peak, he does not tire of rais ing his sharp-pointed, maggot-like head, and complacently ooking about him. They are a rough set of brutes-rank bullies, I should say; for I have watched them repeatedly as a big fellow shouldered his way among his fellows, reared his huge front to intimidate some lesser seal which bad secured a favorite spot, and, first with howls, and if these did not suffice, with teeth and main force, expelled the weake from his lodgment. The smaller sea lions, at least those which have left their mothers, appear to have no rights which any one is bound to respect. They get out of the way with an abject promptness which proves that they live in terror of the stronger members of the community; but they do not give up their places without harsh complaints and piteous groans.
Plastered against the rocks, and with their lithe and appar ontly bonelese shapes conformed to the rude and sharp an gles, they are a wonderful, but not a graceful or pleasing sight. At a little distance they look like huge maggots, and their slow, ungainly motions upon land do not lessen this resemblance. Swimming in the ocean, at a distance from the land, they are inconspicuous objects. as nothing but the head shows above water, and that only at intervals. But when the vast surf, which breaks in mountair. waves against the weather side of the Farallones with a force which would in a single sweep dash to pieces the biggest Indiamen-when such a surf, vehemently and with apparently irresistible might, lifts its tall white head, and with a deadly roar lashes the rocks half-way to their summit-then it is a magnificent sight to see a dozen or half a hund red great sea lions at play in the very midst and fiercest part of the boiling surge, so completely masters of the situation that they allow themselves to be carried within a foot or two of the rocks, and, at the last and imminent moment, with an adroit twist of their bodies, avoid the shock, and, diving, re-appear beyond the breaker.

Wood ashes are stated to be an effective remedy for currant worms. Dust the bushes in the morning with the dry ashes. Three applications, thoroughly done, will be suffi-
cient. ashes
cient

## IMPROVED MITERING MACHINE

The inventor of the device herewith illustrated aims to supply a machine that not only will cut any desired miter, but can also be used for cutting gains and rabbets at any angle, and be used in place of the crosscut saw for light stuff.
Fig. 1 gives a perspectivis view of the machine, and Fig. 2 a sectional view of one of the guides. Upon the table and upon opposite sides of the saw, are formed two grooves, A, which receive the sliding bars, B. At C are semicircular plates, which are pivoted at, their centers to the bars, B, and held in position, when adju sted by the hand screws, D. Upon the curved edge of the plates, C , are formed scales of division marks, as shown in Fig. 1. Corresponding with these scales is a mark or line on blocks which are fitted tightly on the bars, B, though suffi ciently movable, very accu rately to adjust the scales with the saw. These plates, C, are connected to the guides, E, by $a$ sliding hinge, $F$, which serves to longitudinally adjust the inner end of the guide closer to or further from the saw, as may be needed, avd also enables the face of the guides to be set at any desired angle to the table, as shown by dotted lines (Fig. 2), for mi: tering moldings that are not fastened upon a solid. In the face of the guides, $E$, are in. serted step bars, $G$, held in position by the set screws shown. These bars are longitudinally movable, and serve to saw pieces to a given length, by pushing the stuff to be sawn against the hook, H , formed on one end of said bars. This hook is made elastic and will, when pressed up on, sink into the groove be hind it.
The operation of the ma chine will be easily understood by any mechanic, and no further explanation is, therefore necessary.
By having two of these devices the operator is enabled to cut a different angle on each end of a piece of molding, thu saving the time of handling stuff twice. By exchanging them, the guides are made to face in the opposite direction, which is found desirable for many kinds of work. By putting a gaining head in place of the saw, the machine will do all the range of work in that line generally required in a shop. Among the other advantages claimed for this machine are easy and safe handling, susceptibility of accurate adjustment on all points, simplicity, durability, and cheapness.
Patented through the Scientific American Patent Agency, December 9, 1873, by C. Loetscher, 1,238 Jackson street, Dubuque, Iowa, of whom further particulars may be ob tained. Patent for sale on reasonable terms.

## SAFETY BELL SIGNAL FOR RAILWAYS

At night and especially in times of dense fog, it may happen that a train traveling at high speed may run past a danger signal before the same is noticed by the engineer; or, in

case torpedoes are used, they may fail to explode, fand thus not give a timely warning. In order to render the attraction of the engineer a maiter of certainty, M. Scheppers, in the Chronique de l'Industrie, suggests the simple arrangement representsd in the annexed engraving. Two posts are exect-
ed on each side of the track, at a suitable distance from the ${ }^{\boldsymbol{e}}$ draw, switch, or other point, the connection of which the engine driver must be informed of before proceeding. Between the tops of these is a stout wire, on which are three travelers, A, the lower and vertical portions of which serve for supports for a line, B. which passes over pulleys on the posts, is connected with the switch lever, and carries at its free end a counterpoise, C. Secured to the line, B, which passes through and is secured to its vertical arms, is a double lever, D. One arm carries a bell, the other extends down and has a disk-shaped end directly over the middle of the track. When the switch lever is properly adjusted, the counterpoise is raised, and the lever carried by the rope, B, over to the left of the track, as indicated by the dotted lines: should, however, the rails be wrongly placed or left open, the ar-

heads for locomotives, twenty-five or thirty can be made in a day. The molds are made of cast iron, and are used cold. The plungers are generally cast, and duplicates are kept on band for use in case of breakage. The process is also successfully applied to forming of boiler heads, steam domes, etc. the large plates of Bessemer steel being forced through a ring, while a great number of spokes for locomotive wheels re also manufactured in this way
The total production of pressed forgings in these works for nine months was 7,830 pieces, weighing $1,071,200$ pounds.

Hydrogen a Metal.
M. Dumas has communicated to the French Academy some curious experiments of MM. Troost and Hautefeuille on the hydrates of mercury or combinations of hydrogen with that metal. These combinations, it is said, so strongly resemble those which constitute the amalgams of mercury, with silver and other white metals, that it is hardly possible to doubt that they are themselves amalgams, and hence that hydrogen is a metal, a fact apparently indicated in many other analogies.

## CHRISTIE'S RAILROAD

 DETACHABLE CLAW BAR The invention represented in the annexed engraving is an in roved railroad bar provided with a detachable bar, provided so applied as to claw which is train the entire train to be thrown upon a jog and shoulder on the solid portion of the implement. The device, it is stated, will pull spikes straight out of the tie, leaving the bolt ready to be im. mediately driven again.The claw piece, the shape of which is plainly set forth in our engraving, fits firmly up against the main portion of the bar, and is secured by a bolt passing through. ${ }^{\text {. It will be noticed that }}$ the bar has two flat faces, a jos. and an under cut, which fit the corresponding surfaces of the claw so that, as soon as the bolt is set up, the parts are tightly united together. The entire strain comes on the jog and shoulder and not on the bolt, which merely serves as a means of junction.

## LOETSCHER'S MITERING MACHINE

rangement of the connecting lever is such that the counter weight draws the bell lever into the position shown. As soon as a train comes along, a projection on the smoke stack of the engine strikes the disk arm of the lever and rings the bell, thus warning the engineer. The usual signals for the eye, may, of course, be connected to apparatus in the ordinary manner.

## Pressure Forging.

At the State Railway Works, Vienna, Austria, two large hydranlic presses are in use, the largest, with a piston 14 inches in diameter, giving 1,500 tuns pressure, and the second, with an 18 inch piston, giving 600 tuns pressure. The pressure in the pumps is 600 atmospheres. The piston descends upon the work, and for forging ingots it is armed with a hammer-like head. If, for instance, an ingot of soft Bessemer steel, weighing 2,030 pounds, is placed upon the anvil, and the piston brought slowly down, it is crowded into the mass as if it were putty or dough. The piston is then raised, and the ingot is moved forward for a second squeeze, and so on until the first half has been reduced in thickness, when it is turned on edge and the operation repeated. It is then turned end for end, and forged until the whole length has been reduced to the required size. It is cut into masses of the proper length by a chisel forced through the bar by the press. There is no noise or jar in the whole operation, which requires less time than the ordinary method of hammering or rolling, while the pressure affects the very center of the mass ; and there is no distribution of the blow by the vibration of the foundation of the anvil and the surround. ing objects, as there is with the violent impact of a steam hammer. The masses cut from the forged ingots are taken to a heating furnace and are made nearly white hot, preparatory to the operation of pressing. The molds or dies, made in several parts, if necessary, are securely held together by bands of wrint A plunger head or follower, called the bands of wrog the stamp, is attached to the piston and descends into the cavity
of the mold. All the parts being properly adjusted, and the inside of the mold and the surface of the plunger being smeared with thick oil, a block of hot steel is thrown into the cavity, the plunger descends and dresses the steel each way into all the angles and recesses of the mold. When the plunger has reached the proper depth, the piston is raised and the mold and contents removed from under the press. A few blows of a sledge liberate the forging, which is thrown aside to cool. If the work is well done, all the angles are full and solid. All pieces of the same kind are alike in dimensions, and there is no great excess at any part to be cut away. The rapidity with whichintricate forgings are made is one of the greatest advantages of the method. Of suchobjects as cross.

The trackmen, working on a line of road, may be furnished with a number of claws, and in case one should break a perfect one could be quickly substituted, putting the bar again in working order. The claw is quite cheap; and, according to the inventor, costs about one tenth the price of the ordi. nary jaw bar. Its appearance from below is shown in Fig.


Fiy. 2

2. We are informed that the device has been in practical use for two years past with excellent success.
Patented July 18, 1871. For further particulars see adver isement on another page, or address the inventor, Mr. David Christie, Chillicothe, Ohio.

## THE PYROPHONE

M. Frederic Kastner, of Paris, has recently devised a novel and very remarkable musical instrument, which, it is said, produces astonishing effects even in the midst of the largest orchestras. It is termed by its inventor the pyrophone, and we present herewith an engraving of it, taken from LaNa. ture. The origin of the device is due to the curiousdiscovery made by M. Kastner in the properties of singing flames. Many scientists have 'studied these interesting phenomena, but the peculiarities of two flames in conjunction seem to have escaped their notice. As a result of his investigation, M. Kastner finds that if, in a tube of glass or ocher suitable material, two or more isolated flames of proper size be in troduced and located at a point corresponding to one third the length of the tube, reckoning from the base, such flames will vibrate in unison: The phenomenon continues as long as the flames re main separate, but the sound ceases the instant they are brought in contact.
The pyrophone, at first sight, resembles an or gan; but instead of being operated by air blown in, it produces its notes by the singing of the flames within the tubes, the quality of the sound its pitch, and intensity depending of course on the dimensions of the latter. The burners from which the flames emerge are so arranged that the flames run together, but may be separated instantly by pressing down a key on an ordinary koy board, seen in front. The position of the key in relation to the sound' is the same as upon the piano o organ. According to the law above cited, as soon as a key is pressed the separated flames, in the corresponding tube, give forth a note, continuing, as in the organ, as long as the key is held down.
It is said that the music thus produced is ex tremely beautiful, and that the sound close resembles, in delicacy and purity, that of the hu man voice.

Condensation in Steam Cylinders. Condensation in steam Cylinders.
By the use of lead facings to pistonsand cylinder lids, a considerable economy in the use of steam may be effected. An iron lid and piston will, other things being equal, condense more than three times as much steam as a lead-faced piston and lid. The thickness of metal heated and cooled at each stroke is not considerable, and not far into the metal, a zone of constant tempe rature, lower than that of the steam, will be found. The distance from this zone to the inside of the cylinder will depend on the conducting power of the metal, and will be about 9 for lead to 12 for iron. It may be shown that, in any case, the thickness of the lead facing may be kept within very moderate limits. Other materials may be used for the same purpose, as, for 'nstance, tin, the specific heat of which is 0.562 , its specific weight being a little leas than that of iron. Its conducting power is, however, in excess of that of iron, being as 15 is to 12. Slate or hard pottery ware might also be employed, but on the whole the balance of advantage appears to lie with lead.-The Engineer.

## THE STEAM SIREN OR FOG HORN.

Fog signals, many of which are required at different points on the Atlanticand Pacific coasts, are of seve
are steam whistles, the sound of which is made deeper or louder by being sent through a trumpet; but the most effective is probably the siren. This ingenious machine consists of a long trumpet and a steam boiler. The sound is produced by the rapid revolution past each other of two flat disks pierced with a grest number of small holes; a jet of steam under high pressure is projected against the disks, which revolve past each other more than a thousand times a minute ; as the rows of small holes in the two disks cone opposite each other, the steam vehemently rushes through, and makes the singular and piercing noise which a siren gives out. One of these machines, of which we give an illustration, costs about $\$ 3,500$ comgive an illustration, costs about $\$ 3,50$
plete, with its trumpet, boiler, etc.
plete, with its trumpet, boiler, etc.
Daboll's trumpet is worked by an Ericsson engine, and requires no water for steam. Congress rightly has great confidence in the scientific skill and integrity of the Lighthouse Board. At the last session, besides the usual appropriation for the maintenance of the lighthouse system, it gave the money needed to build forty new lighthouses and ten steam fog aignals. If we gver have a merchant marine of our own again, our seamen will find the stormy and rock-bound coasts of their country well lighted for them.-Harper's Magazine.

Production of Light in Stones. - When various kinds of hard stones are pressed by the workmen (with their hands) against quickly revolving grindstones, the transparent stones become pervaded throughout with a yellowish-red light, like that of red hot iron. Opaque stones give a red light, at the place of contact, with halo and sparks. Dr. Nöggerath thinke the phenomenon worth studying by physiciats.


## THE PYROPHONE.

verized gum shellac in ten times its weight of strong ammonia, when a shining mass is obtained, which, in three or four weeks, will becomeliquid, without the use of hot water. This softens the rubber, and becomes, after volatiliza. tion of the ammonia, hard and impermeable to gases and fluids.

Mineral Statistics of Great Britain for 1873. The London Times gives the following statistics, showing the metallic and mineral productions of Great Britain for 1873. The total value of metals mined is $\$ 110,800,000$; of minerals, pottery materials, etc., $\$ 9,000,000$; of coal $\$ 531$,400,000 . Total, $\$ 651,200,000$. The excess of value over 1872 is about $\$ 66,400,000$, and is due to the influence of the


THE STEAM SIREN OR FOG HORN.
combustible element, which has attained exceptionally high prices. The quantity of coal transported by railroads and canals shows an increase of production of $4,305,617$ tuns over the previous year. The increase of consumption by the metallurgicindustries is but 6,073 tuns, the smallness of which is accounted for by the stricter economy practised in all establishments on account of the high prices. The exports of fuel amount to 450,505 tuns.

The Latest British War ship, the Infiexible. rom a paper recently read before the Institution of Naval Architects, This is the ship which the progress of in ention in artil ery has finally driven us to resort to. Had the manufacture of enormous ordnance been stopped when the 35 tun gun was introduced, we might have been satisfied with the Fury, with her guns of this nature, and her 14 inch armor. But English artillerists were ready to make guns of twice 35 tuns, and foreign powers were known to be building ships to receive such guns.
There could be no question that we could not allow foreign seamen to have guns afloat more powright than any of our own, however ready elves with been to allow them to defend selves with thicker armor. Although, therefore, it was known that the ships in which these guns were
to be mounted were to be protected by 22 inches of armor, thickness of armor was not made a ruling feature of the design of the first-class ship, which was to mark the next step in advance upon the Fury-but the first of the ruling conditions was that she should be able to mount the heaviest guns which could possibly be made now, and, by some easy modification in her construction hereaf ter, guns of twice that weight, when they can be manufactured. The other conditions were that she should have a speed of 14 knots at the mea sured mile, and that she should not exceed the di mensionsand cost of preceding ships. It was found to be possible, in conformity with these conditions, to protect the hull by 2 feet of armor.
I may describe the Inflexible to you briefly in the following manner: Imagine a floating castle 110 feet long and 75 wide, rising 10 feet out of the water and having above that again two round turrets planted diagonally at its opposite corners. Ima gine this castle and its turrets to be heavily plated with armor, and that each turret has witbin it two guns of about 80 tuns each, perhaps in the course of a few years, guns of twice 80 tuns each. Conceive these guns to be capable of firing all four to gether at an enemy ahead or on either beam, and in pairs towards every point of the compass. At tached to this rectangular armored castle, but com pletely submerged, every part being 6 feet to 7 feet under water, there is a hull of the ordinary form with a powerful ram bow, with twin screws, and a submerged rudder and helm. This compound structure is the fighting part of the ship. Seawor thiness, speed, and shapeliness would be wanting in such a structure if it had no additions to it; there is, therefore, an unarmored structure lying above the submerged ship, and connected with it, both before and abaft the armored castle ; and as this structure rises 20 feet out of the water, from stem to stern, without de priving the guns of that command of the horizon already described, and as it moreover renders a flying deck unneces sary, it gets over the objections which have been raised againgt the low freeboard and other features in the Devasta ion Thunder, and Furs. These atructures furnish also lon, Ther ort in 14 inch tep in advance has, thers 80 . 24 inch; from 35 tun guns to 80 tun guns; from two guns ahead to four gunsahead; from a hight of 10 feet for work ing the anchors to 20 feet; and this is done without an increase of cost, and with a reduction of nearly 3 feet in draft water.
I cannot attempt to describe the numerous novel and interesting features of such a design, but I may say that no pains have been spared to protect her against under-water attacks, by the isolation of the independent engines, the subdivision of boiler compartments, and such further subdivisions as were possible with dueregard to proper facilities for moving about. The result is that the ship is perfectly and easily workable, although she is divided into 127 watertight compartments. My belief is that in the Inflexible we have reached the extreme limit in thickness of armor for sea-going ships. The temptation is always great to secure more and more power by the expenditure of ever increasing sums of money, but it is my conviction that we shall not, in any future ship, go beyond this expenditure. Some of the ironclads designed ten - or twelve years ago cost more than the Inflexible will. In the Inflexible provision has been made both offensively and defensively, for an enormous increase in the powers of artillery without any increase in the cost of the ship.

Iron, published in London in the inte rest of the metal manufacturers, says: " American hardware and machinery are being imported largely into Germany. The handy shape, the new contrivances, and generally good workmanship, are features in their manufacture which find many friends in Germany and in Russia." This is no new fact to ns, but it is the first time we have known an English journal to acknowledge it.

Blacx currant leaf tea is recommended for dyspeptics.

## the enalish telegraphs.

## by GRORGE B. PREBCOT

## CONSTRUCTION OF THE LINES.

The construction of the English telegraph lines is uniformly excellent, and reflects great credit upon the Engineering Staff, in whose hands it is placed.
The timber used for poles is generally larch treated with sulphate of copper, or red fir creosoted.
The creosoting is accomplished by the Bethel process. The poles are placed in an iron receiver and the air exhausted from them, after which boiling creosote oil is forced into them by pressure. This process greatly increases the durability of the wood, pine and spruce being thus rendered as lasting as
cedar. The odorof creosoted poles in some places is said to be offensive, but no objection is raised against them in England offensive, but no
on this account.
The poles are
The poles are never creosoted until they have been stacked a sufficient length of time to be thoroughly dry.
The cost of creosoting includes a certain margin for loading into trucks, or on board a ship, which is always stipulated for when the contracts are made.
It sometimes happens that a parcel of poles are exceptionally dry, in which case they are given an extra two pounds of oil per cubic foot, costing from six pence to eight pence per pole additional.
When poles are used, which are neither prepared with sulphate of copper nor creosote, they are well seasoned, and then painted, the butt ends being slightly charred fr
bottom to a foot above the ground line, and tarred.
bottom to a foot above the ground line, and tarred.
The cross-arms are made of English oak, two inches thick and twenty-four and thirty-three inches in length, and are placed alternately on either side of the pole. A twenty-four inch cross arm is placed on the front of the pole a foot from the top, and then a foot lower down a thirty-three inch cross cases as many as seventeen wires are carried upon a single line of poles of twenty-five feet in length, and no cross arm carries more than two wires, except on the double pole lines, where seven feet cross arms are employed, and four wires are supported upon each cross arm.
All the poles are provided with earth wires, or contact conductors for carrying the wet weather escape directly to the earth, instead of permitting it to leak into the neighboring wires. The earth wire consists a piece of No 8 galvanized iron wire, extending from the top of the pole to the bottom, so as to expose as large a surface as possible to the earth. From the thick earth wire, branches, composed of No 10 gal . From the thick earth wire, are carried in saw grooves sunk in the cross arms, and soldered to the insulator bolts. The work is
performed at the factory before the cross arms are carried performed at the factory before the cross arms are carried
out on the line. The earth wires sometimes project above the top of the poles, and serve an excellent purpose as lightning arresters.
Great care is taken to keep the poles in a ripidly upright position; and in addition to placing them well in the ground and tamping the earth thoroughly around them, they are rods, which run into the ground about four feet. On straight lines and slight curves, where exposed to the winds, double lines and slight curv
stays are employed.
insUlators.
The insulators on the railway routes are uniformly of the Varley double cone brown ware pattern, and those upon the canals and highways of the single cone white ware, or porcelain. The Varley insulator is regarded as the best, but its greater cost has prevented its exclusive use.

THE CONDUCTORS.
The conductors employed upon the English lines are composed of zinc-coated iron wires of Nos. 4, 8, and 11 gage. The No. 8 gage- $0 \cdot 170$ inch diameter-is the size in general
use: the No. 4 gage- 0.240 inch diameter-being employed use: the No. 4 gage- $0 \cdot 240$ inch diameter-being employed
upon a few of the long circuits between the more important points, while No. 11-0.125 inch diameter-is used for short lines only.
The method formerly followed of allowing the wires to pass freely through the insulators, and fastening them only at distances of half a mile, has been abandoned in favor of bind-
ing th $\in \mathrm{m}$ at every pole, No. 16 charcoal wire being used for binding.

## Jointing the wires.

Great care is observed in the jointing of the wires, which is invariably performed upon the line, no joints by the wire makers being permitted. The joint exclusively adopted is that known as the Britannia joint. This is made by slightly bending the ends of the two wires and placing them side by side for a distance of three inches, and binding them tightly together with No. 19 wire, and soldering them thoroughly. All joints are required to be soldered, whether the wire be old or new, galvanized or plain. The leading-in wires at the offices varnished with a preparation made of linseed oil and Storkholm tar. These wires are re-tarred from time to time to prevent decay.

> THE OVER HOUSN WIRES. o wires are erected in ans

The over house wires are erected in spans, supported by iron poles attached to cast iron saddles, which are fitted at the ridge of the roof. The poles are light and well stayed by wire ropes. In London, cables containing 50 insulated wires are suspended by hooks from No. 8 iron wires, carried in the manner described above. The conductors in these cables consist of No. 22 copper wire.
wires, of No. 16 gace and 454 yard composed of seven steel wires, of No. 16 gage and 454 yards long, is auspended over
the Tyne, and supports a cable containing fitteas conductors,

The cables rest upon ebonite chairs attached to the rope by means of rings placed at distances of 12 feet apart.
The over house wires are used principally for lines which are leased by the Post Office Department to private firms or individuals for the transmission of messages on their own special business between offices, factories, etc., and which make a system of nearly 5,000 miles.-Journal of the Telegraph.

The Chemical Claesification of Iron.
M. Frémy, an eminent French chemist who has recently been studying further into the metallurgy of iron and ateel, thinks that it would be of much more advantage to founders according to its physical properties, should be known with reference to its chemical characteristics, that is to say, in accordance with the very small quantities of carbon, sulphur, phosphorus, etc., which it may contain, and which chemical analysis would reveal. This chemical classification has for some time past been in use in Krupp's celebrated foundery, where, in fact, nothing is left to chance. Chemists constantly analyze the crude materials and the fabricated products. The scientific and industrial element is intimately connected with the military. Artillery officers examine the manipulations and follow their every detail. Considerable sums are devoted to new experiments, made on the different alloys which may bes suitable for cannon, and of each metal tried there is compiled a record which indicates its chemical composition, its advantages, and defects.
According to M. Frémy's investigations, it appears that the best metal for guns is neither iron nor steel, but some combination of both.

## New Street Rallway Locomotive.

A trial recently took place on the Manchester, Sheffield, and Lincolnshire railway, between the Grange Lane and Tinsley stations, of a tramway engine, constructed by the Yorkshire Engine Company, upon L. Perkin's patent systern, for the Belgian Street Railway Company, Brussels. The novel features of this engine consist inits not emitting any smoke or steam into the atmosphere, and making comparatively little noise. The engine used steam at 500 lbs. to the square inch, and maintained this pressure by natura draft without any difficulty. The engine is compound, and expands the steam to the most economical limits, and then condenses it by means of two air surface condensers placed one on either side of the machine. The engine can be driven from either end, all the driving gear being duplicate to ob viate the necessity of turntables. The engine accomplished a ppeed of fifteen miles per hour, drawing its full load up gradients varying from 1 in 200 to 1 in 80. -Iron.

## Ballooning Extraordinary.

Werecently published a note of Mr. Croce-Spinelli to the French Academy of Sciences, in which he indicated the belief that existence could be maintained at very high altitudes by aeronauts, if they should provide themselves with cylinders of oxygen, to be breathed in the highly rarefied atmosphere. M. Spinelli and Sivel have lately demonstrated the truth of this view by ascending in the Etoile Polaire, a balloon of 98,840 cubic feet capacity, to the immense elevation of 25,841 feet without inconvenience. The barometer level descended $11 \cdot 7$ inches, showing the abovealtitude,which is higher than that obtained by Gay Lussac and nearly equal to the point reached by Glaisher in his famous ascension. The ther mometer at minimum marked $7 \cdot 6^{\circ}$ below zero Fah. The aeronauts, having taken with them all necessary instruments,
made a number of valuable observations which, we learn made a number of valuable observations which, we learn
from Les Mondee, will shortly be communicated to the French Academy.

## Rain Cannonades.

Mr. Edward Powers petitions Congress to authorize a eries of experiments to produce rain by artificial means, during dry seasons. This,he pointsout,mey be accomplished by the firing of heavy artillery. In back numbers of the Scientific Ambrican, we have given many apecific examples of rain storms which have followed heavy cannonades, and European with various batties, during the late rebelion concussions of 'artillery, when sufficiently long continued, may have a condensing or aggregating effect upon the aerial vapors, and so induce the fall of rain. When the national
debt is paid, or specie payment resumed, we think it might be well to barn some public powder as suggested by the present petitioner. B
postponed until then.

## A Chance for Investors

The attention of parties desiring to invest in patents is diected to the announcement of Messrs. F. A. Hull \& Co., manufacturers of the Danbury drill chuck, published in our advertising columns. This invention'was fully described and illustrated on page 214, Vol. XXIX. of the ScIEntific AmeRICAN, and is a three-jawed lathe chuck so constructed that all the jaws are simultaneously moved, in radial directions,
by the revolution of a single rightand left hand screw. The action is direct and positive, and, it is claimed, cannot clog, wet, or in anywise get out of order.
We are informed that, since the placing of the article upon the market, it has met with a ready sale, and has given gentent in eaction. The owner, desiring to dispose of the paterprize, offers the same at quite a moderate price. Judging from the representations of the manufacturers, we presume that any one, having the requisite capital, will find the investment highly profitable.

The St. Louis Bridge. - The iron work is now complete, wo weeks in advance of the contract time. A grand banquet has been given by the Keystone Bridge Co., contractors, to their employees, some 200 in number, at the Grand Central Hotel. The approaches will now be hastened to completion, railroad tracks laid, and carriage ways finished as speedily as possible; and the indications are that the bridge will be thrown open to public traffic at a much earlier day than was anticipated.

## 

Improved Stone Pavement.
$\begin{aligned} & \text { Andreas Etchenberg, Columbus, Ohio.-This invention is an improve- } \\ & \text { ment in stove road beds, and corsists in arranging an upper vertical lager } \\ & \text { with a horizontal layer of flat stones. Both break fonts to insure a greater }\end{aligned}$ Fith a horizontal layer of fat stones. Both break joints to insure a greater
degree of stability of the findividual pleces in their normal position. Sand degree of stability of the individual ple
or gravel is used to fill the interstices.
Harrison W. Curtis, Philadel phia, Pa., assignor to Joseph L. Ferrell, same place.-This inventlon consists of an arrangement of the Idie pulleys used
for turning a driving belt out of a right ine for a belt shifter by mounting for turning a driving belt out of a right line for a belt shifter by mounting
them on a swinging frame in a line cutting the center of the angle between them on a swinging frame in a linecu
the two lines in which the belt runs.

Improved Grain Tally.
Gecrge P. Fitts, Jacksonnhe, backward on gulde ralls between stop pins. A measure is retained in position on the carrlage by pegs, and placed under the spout of the thresting machine, passing under cross bars for equalizing the grain in the same.
The attendant moves the carriage in one direction, when one measure is The attendant moves the carriage in one direction, when one measure is
filled, and empties the same while the other measure is flled from the filled, and empties the same whille the other measure is filled from the
spout. He then moves the carriage back, taking off the second measure spout. He then moves the carrlage back, taking of the second measure
when full, and repeats this operation, a registering device keeping a correct tally of the grain measured oft, forming thus a very conventent self rect tally of the grain measured onl, forming thus a ve
acting apparatus for counting the number of measures.
J. Russell Little, Jamaica Plains, Mass.-This is an improved coupling or connecting thills or a pole with the axle of a cariliage. A retaliner
Which is a small bar of iron, the ends of which work in slots forned in the oke of an axle cllp, when pushed into the forward ends of its slots, comes o far over the hook head of the thill fron as to prevent the sald thill iron frombeng ralsed from the bolt. The retainer is held forward by a spring,
which will allow it to be pushed back when it is desired to attach or detact which will allow it
the thills or pole.

Improved Bobbin Winder for Sewing Machines. Moses Cook and Moses G. Cook, Ashfleld, Mass.-This invention consists a drum with a reversing cam groove for working the traversing guide for ward and back along the spool hae the necessary slow motionimparted to it by a pawl and a friction griptng strap. The pawl is worked by an eccentric
on the bobbing turning shaft, which receives motion from the sewing ma
俍 on the bobbing turning shaft, which recelves motion from the sewing mahine wheel by a friction wheel. An adjusting screw regulates the extent of the pawl's movements so as to turn the drum fast or slow, according to
the size of the threads, and the drum has a friction strap and spring for the size of the threads, and the drum has a friction strap and spring fo
holding then released by the griping spring. The bobbin has a apring on its apindle for fastening the thread to it at the beginning. The spool on
holder has a tension spring to regulate the unwinding of the thread Impro
Improved Combined Gang Plow, Cultivator, and Chopper.
Jonn J. Watrous, West Point, Ga.-This invention has for its object to Jonn J. Watrous, West Point, Ga.-This invention has for its object to
urnish an impioved machine which may be readily adjusted for breaking up and bedding land, and for cultivating and cbopping the crop. By sultable construction no tongue is required, which enables the machine to be able construction no tongue is required, which enables the machine to be
urned in a very small space, and the chopper is operated by its advance. The chopping hoes may be conventently adjusted to work deeper or shal Ower in the grouud, as may be desired. The chopper may be easily raised
rom the ground, and thus preventeufrom working, and, when not required from the ground, and thus preventedfrom working, and, when not required
or use, may be detached. The plowa may be adjusted to work shallower or deeper in the ground. Any desired number of plow beams may be used accordtng to the krnd of wors to be done. Suitable construction also
allows the rear ends of the plow beams to have a free vertical movement. Improved Pitman.
George L. Jones, Vanville, Wis.-This invention consists in a pitman aving a side-notched eye at each end. and a collar bushing combined with
pin secured at both ends by a nut. By this construction, a washer avd pin eye of the pltman can be forced farther upon the pins to take up the wear, by screwing up the nut.

Improved Machine for Making Animal Shoes.
William Hamillon, Fallsburg, assignor to James L. Lamoree, Grahamville, . .- This iavention consists of an anvil, trip hammer, and two side hamthe top, and the hammer has a face which is the same form in outline as that of one side of the shoe to be made, but wider, so as to insure the ham-
mering of the upperside of the blank over all its surface. The hammer is sliso beveled or inclined to vary the thickness of the shoe and produce the equisite shape for the top. One of the side hammers is sha ped in respect of the contour of its face to correspond with the required shape for the outer edge of the shoe; the other is shaped to correspond with the inner edge, and both rest on the face of the anvil, and work toward and from ach other to hammer the edges of the blank. These hammers perform weir operation while the trip hammer is raised, and then move out of the them which is required by the greater width of the hammer than that of the blank. The side hammers are operated by the helve of the trip hammer one being connected directly to an arm projecting from its axis by a rod or hank, so as to be thrown formard when the hammer rises, and the othe belng connected to the same arm by a similar rod, and an intervening rock vation of the trip hammer. A bar is arranged on the trip hammerhelve, to he acted on by the tappot wheel for ralising the hammer, which sald bar fe ointed to the shank, and arranged to swing out of the path of the tappet oo throw the hammer out of gear, and into their path to put it in gear again.
lmproved: Adjustable Catch for Latches.
George W. Burr, East Line, N. Y. -This invention is an improvement in the class of catches for door and gate latches, which are made vertically
adjustable to accommodate the various positions the door or gate may ssume in consequence of shrinkage, swellings, or other cause. The invention consistsin combining a $T$-shaped catch with a slotted holder or guard plate, which is secured to the gate post by screws, so that br means the ce catch may be clamped and held by friction at any deatred poin Improved Corn Plow.
Jeremiah H. Trout, Kingwood, assignor to himself and Isaac S. Cramer, ergeantsvilie, N.J. - The shovel standard is made in two parts and jointed
allow an outward lateral movement to the lower part, with a sping on o allow an outward lateral movement
he outside and a lever on the inside. The draft bars, which are attached to the frame and run along through slots in the plow stocks, are connected
to the stock by wooden pins, which are prepared, in respect of their to the stock by wooden pins, which are prepared, in respect of their
strength, so as to break readlly fif the plows encounter too great resistance. strength, so as to break readlly if the plows encounter too great resistance.
The stocks are plvoted to the frame, so as to swing back in case the pirs break. Improved Ice Machine.
Tmproved Ice Machine.
Thomas F. Peterson, Macon, Ga.-This invention consists of a boiler, condensing coll and coollng tank, recelver, freezing coll and tank, and pumps, all combined and arranged so that the ammoniacal gas expelled
from the botler by heat is compressed and condensed in the condensing rom the boiler by heat is compressed and condensed in the condensing
coll, and then, after pasoing through the recelver, ts let into the freezing coll, so as to expand therein and freeze the water in the tank by taking up con, so as to expand therein and freeze the water in the tank by taking up
the heat from It . It then pumped directly into the boller again for re. peating the process, and takes with it the heat obtained in the freezer, and nas utillzes it inctoed of vesting it.
 den, seme place.-There is an anvill die and a hammer die for hammering
downand reduclng the end of the tube to be tnserted, in the plece to be down and reducting the end of the tabe to be tngerted. In the plece to be
welded on, or for recelving the ferrule on the end to be fitted in the tube. The anvil die has a part of its concare face made on a clrcle enough larger to equal the thlckness of the metal of which the tube is made, go
that the mandrel on which the tube tis to be hammered, betng entered in
the end to be reduced, will hold the tube. When hammered by the die, it the end to be reduced, will hold the tabe. When hammered by the die, it
will reat thereon, so as to be sutably contracted and reduced, and not will reat thereon, os as to be sultably contracted and reduced, and not
stretched or drawn out larger, as it would be if hammered on the mandrel
alone. A Ahoulder on the noder part of the anvil dide forma the gage for alone. A shoulder on the under part of the anvil die forma the gase for
length. The anvil die and bammer dte for welding the tubes together are

 Is of constderably greater leng th than the hammer die, to avold angular
Indentations in the surface of the tube. They also have a mandrel. The tubes are presented from the rlkht hand sides, and held by the other end th
the band of the attendant, to be turned and siffed about, as required.

Improved Watchmaker's Tray.
Lrman B. Milliken, Saco, Me.-The object of this invention is to furnlsh for the obe of watchmakers a conventent and handy tray, which enables
the workman to take down a watch movement and keep the different the worrman to take down a watch movement and keep the different
wheels, each with its corresponding bridge, plns, and screws, separate, so that there is afterward no trouble or delay in putting the movement togethat there is afterward no troable or delay in puting the movement oge-
ther. The invention consists of a concared tray of saltable shapeprovided
with a sertes of concave indentations, and a central raised part with similar concavity, on which the plate ts placed at different stages of the w
while the detached parts are arranged separately around the same
Simeon Smith, Jr., Newburgh,Tenn.-Thisinvention
nation, with a hopper and seed disk of a beam havisis in the combination, with a hopper and seed disk, of a beam having a reeess filled
with compresible material behind a spring, to keep the space full to ex-
Clude the grain, and allow the spring to work the grain to pass under the pad frecly, and prevent any catching and cut. ting or breaking of the grain.

> Improved Die for Forging Hammers. Lindsay, Chicago, mll.-This invention consista in

James R. Lindsay, Chicago, M. M.-This invention consists in a device for
cutting metal formed of two cutter bars connected by straps to a hand lever. and the cutters so shaped that bolts and rods of varying size, shape and conflguration may be cut with equal facility.

Improved K nob Latch.
Haven, Conn.-A milled head
Walter Varah, New Haven, Conn.- A milled head beng turned, a sleeve (by its spiral slot, in which is a pln) moves another sleeve tnwardly or out-
wardly, thus throwing a stud into or out of the notch of hub. Thus the spindlemay be connected with or disconnected from the hub that operates the bolt.
Improved Game Board.
Jacob Daring Spang, Dayton, O.-This is a toy race track upon which quite an amusing game may be played, serving, according to the inventor,
to illustrate, on a small scale, the spirit and excltement of the turf. The to illustrate, on a small scale, the spirit and excltement of the turf. The
race fleld track or platform is inclined when in use and surrounded by a race field track or platform is incliaed when in use and surro nded by a
mimic fence or enclosure. There is a starting station in which representa-
tive horges or balls are placed, the hor ees or balls being severally marked, and the number betng optional. A bottom hinged gate is held across the and the number being optional. A bottom hinged gate is held across the
outlet by cords which pass through holes in the platform or track. As soon
as this gate is depressed the balls will pass out. They wil first encounter as this gate is depressed the balls will pass out. They will first encounter
posts, arranged in transverse rows.the individual posts of two rows not posts, arranged in transverse rows. the individual posts of two rows not
belng opposite or in allgnment, but each one occupying a medlan position
betwen the two nearest posts of the opposite row. The balls will be re. tarded more or less by the posts, as well as diverted from their course, but tarded more or less by the posts, as well as diverted from their course, but
will all come to the cross hurdle, which is inclined on the face that is opposte to the starting station. They next will move over this and pass
throagh the three rows of posts to and over asecond hurdle. In passing through the three rows of posts to and over a second hurdle. In passing
through the next section of the race course, two transere rows of sta. bles or stops will be met by some of the balls, whtch will be caught and mediate crops row of posts. They will now paes over another hurdie and more stops and finally reach the goal. Those wblch succeed in reaching
the goal will not, however, arrive simultaneously, but successively, thus the goal will not, however, arrive simultaneousily, but succesively, mins
enabiling the one arriving frst to be accounted the winner and to score the highest number or count in the game, while others are allowed a count
accordfng to their relative time of arrival.

Improved Gas Stov
Cbarles Wittect and William G. Stetnmetz, New York city.-The base part of the
ranged above the same. The burner nearest the supply plpe produces the mand draft through the passages, and is, therefore, allowed to burn contin.
ually with a full supply of gas, while the supply of the other burners is ually with a full supply of gas, while the supply of the other burners is
cegulated bya suitable stopcock. A horizontal partition plate separates the lower part of the base from the upper part, which forms with the top
plate the combustion chamber. The partition is vertically adjustable in plate the combustion chamber. The partition is vertically adjustable in
slots. The admission of alr to the combostion chamber is accomplished through the nerforations along the upper part of the base. The quan-
tity of air required for the full combustion of the gas is regulated by tity of air required for the fall combustion of the gas is regulated by
the higher or lower position of the partition by which the slots are partially opened or closed. The burners connect with the combustion chamber by pipes which open into metallic extenalon burners which extend
along the side walls of the base. The air slota are provided with narrow along the side walls of the base. The air slota areprovided with narrow
slota, through which the blue heating fames of the gas lesue. A large slota, through which the bine heating fames of the gas issue. A large
air hole is arranged in the base for the admisaion of a stronger current air hole is arranged in the base for the
to the larger casing of the main burner.
Improved Ear Tube.
Henry b. Auchincloss, New York ctty.-This invention consitats of a
tube arranged in any seat of a hall, church, or stmillar public bullding, tube arranged in any seat of a hall, church, or stmillar public batlding, the ear of the user. The lower end of the tabe is designed to pass down
through the seat, and be connected with a tin tube passing beneath the throagh the seat, and be connected with a tin tabe passing beneath the
seats or floor, and passing up near the speaker's deak, where it should terminate in a funnel-shaped mouth.

Improved Cam Slide for Sening Machines. of a block of steel or other material on the end of the needle arm which works in the cam groove, so constructed as to alde in the groove as a
substitute for the roller commonly used. The block is divided into two separate pleces, whose exterior faces are shaped so as to allow them to sllde freely along the varying angles of the cam, and the interior faces are
made to permit an independent oscllating motion of each part on the stud made to permit an independent oscillating motion of each part on the stud
of the arm. The invention also consists of a spring between the blocksto keep them apart to take up the slack that may occur by wear, and cause them to fill the groove at all times.

Improved Lamp.
Bernard Fanta, Milwankee, Wis.-This invention is a kerosene or petroleum lamp having a welghted sheet metal base, converging, and provided
with a flange having a polygonal periphery suspended above the plane, Which supports the base of the lamp. This prevents the effect of an overturn by catching upon the table or other subjacent articie. Just after the
center of gravity has passed beyond the base. A rebound ts created that center of gravity has passed beyond the base. A rebound is created that
throws the lamp back, and causes it to regain its equilibrium, or afrords the per
done.
Improved Hoof Trimmer.
David Booker and Cornellus N. Tosh, Palmyra, Ill.-This is an improved hoof trimmer, by which the horse's hoof may be neatiy pared on the flat part, cleaned from the dirt, and trimmed at the outer edge, so that the
hoof is quickiy and fully fitted to the shoe. It consists of a main cutting hoof is quickly and fully fitted to the shoe. It consists of a main cutting
knife at the end of a strong bar, with handle end. The knife is curved outknife at the end of a strong bar, with handio end. The knife it curved out-
wardly to a point,and serves with its end for paring and cleaning the hoof, Whlle the lower part is used, in connection with a second amsller carred
knife, which is pivoted to the larger, and operated by piroted connectiog rods od hapd lever, uke theara, for trimming the hool.

Improved Sprink Shank for Boots and Shoes.
Emil not only stronger at the potint of greatest atrain, and more fexible ea the fore ends, but which may aloo be adjuated to varlous degrees of elas.
tictr, as required. Two spring shanks, of equal length det ticty, as required. Two spring shanks, of equal length and strength, are provided at the heel ends for attaching them to the heel and adjusting heir front ends without weakening the heel part.

## Improved Plow.

Ed ward Walter, $\mathrm{sin}_{\mathrm{s}}$ lisbury, Mo.-The upper part of the standard is bifurtedithe main arm betng plvoted to the beam. while the curved backward a nut and washer. The beam is raised or lowered as the nut is turned nd thereby the share elevated or depressed accordingly. The increased below the beam.
Improved Bag Holder,
Erasmus D. Hix, Payne's Depot, Ky.-This Is a bag holder for filling wheat, corn, and other cereals into sacks in the granary; and it constists of a strong
supporting standard, in which slldes adjustablythe end of the curved steel supporting standard, In which slides adjustablythe end of the curved steel
arms which spread sidewise, and are bent at their front extremitles, under sultable angles, into a connecting spring. hoop, over which the hem of the bag is
hoop.

Improved Organ Coupler.
Charles W. Fossler, Adeline, III., assignor to himself and Chrititian Fose ler, same place.-Thts improved organ coopling device consists of a plvoted on throwing the platform up, the keys will come in contact with the arms When depressed, and thereby couple the corresponding pins to those orig1-
nally depressed by the keys.

Improved Grading Apparatus.
Ole Matson. Mollne, III.-Thists an improved apparatus for moving earth
from one place to another, in grading roads, lawns, etc. The driving sheft revolves in bearings in a frame staked to the ground, and is connected by hevel gearing with a pulley around which passes an endless chain. The
chain also passes around a grooved pulley, piveted to one end of an arm. the other end of which has a hole formed th rough it to allow it to be placed upon a post. The otherpart of the cliain is held out of the way by passing around a grooved pulley, pivoted to the end or a bar, upon the outer end or
which is formed a hook or ege to enable the end of a rope to be conveWhich is passed over the end of a screw post. The line is held in place upon Which is passed over the end of a screw post. The line is held in place upon
the pulley by a line holder, whicli consists of a wing pivoted in the fork of a plate. In such a way that the edges of sald wing mayshut down against
the arms of the plate. and thus hold the said line. The line holder thus holdsthe endless chain in place, and enables any slack to be conventently
taken up. Scrapers,made of a slagle plate of tron, are provided with holes orecelve wooden handles, and with ears to recelve the draft chain, which is connected with the endless chain. The scrapers may be filled and emptied at any required points of the circuit of the endless chain, and the posi-
tion of the aaid chain may be readily shifted by moving the screw posts tion of the asid chain may be readily shifted by moving the screw posts
from one place to another.
Improved Apparatus for Feeding Steam Boilers with Air.
Martin E. Bollinger, Littlestown, Pa. - An air pipe leads directly from the feed pump to the boller through a heating coll surrounding the fire, to his, with the airfeed pipe, is provided with a check valve and engine to let off the pressure for a short time when starting. The steam pipe of the water is tapped into the bofler shell, near the smolize stack, below
of tincula

Improved Variable Exhanst Valve.
David $\mathbf{H}$. Seamon, New London, Conn.-The valve is in the form of a hollow truncated cone reversed, and is seated on the upper end of a tube.
Guide rods, rigidly connected with the valve by means of arms, pass through ears of the tube, and are connected with a semtccrcle on the end of a lever which extends back to the englne room, so that the valve may
be operated by the engineer or freman, as occasion may require. For producing what is known as a "sharp"exhaust of steam into the chimney,
the valve is kept closed, so that all the steam passes through the valve. For a less sharp exhaust, the valve is raised so as to make an annular open
ing between it and the seat. By ralsing the valve in this manner, the annu. lar opening is graduated in size to suit the exigencles of the case, the lever being arranged so that the valve may be get and held in any desired position.
Improved Seal Lock.
Daniel T. Casement, Painesvile, O., at present residing at the Fifth Avenue Hotel, New York ctty.-This invention consists in connecting a in to disengage the hasp, the other will be thruat out through the seal corresponding to that end of the hasp with a notch of peculiar form attached to the door by means of a screw bolt, and has a lip ifting over
the open end of the card-holding frame. The bolt paseas through a slot in the sliding hasp. The frame for conining the seal is provided with ough and jagged notchos and points fo make it mposible to cut oat the card, if preferred, and, when used, the seal punch mas be dispensed with as the glase will have to be broken to work the puin pin; and when the
lock is aduasted for the useof the swinging hasp, the mouth will be suita lock is adjusted for the use of the eswinging hasp, the mouth will be sulta.

Improved Device for Checking Horeos.
Edwin R. Ray,Columbus, Ky.-Two bridle check rein pulleys and a pulley for a hand reln are made in one plece, having through their center a shaft The ends of the shaits are made fast to the hames, reaching from one adde oridle are attached other pulley a hand strap or refn is atteched, and is wound aroond it. The difference in the diameter of the bridie and strap
a purchase on the bit, which controls the horse.

Improved Machine for Upsetting Tyres.
Mathlas Schon, Eng1shtown, N. J.-This is a machine for upsetting of shortening wagon tyre or iron bars of olier descriptions that may be opestationary head and gulde a hinged head. The stationary head is also attached to the edge of the stand. These heads are placed crosswise of the bars, each having a fiange, against which the adjusting blocks are
placed. Gripe jaws, one on each of the heads, have levers, and are conplaced. Gripe jaws, one on each of the heads, have levers, and are con-
nected by the jointed bar which 18 attached to an opera:lng jaw. By working the later, po wer is appiled to one or caused to gripe the tyre. The tyre is in a heated state, between the twojaws, and is firmly held, so that it can have no longitudinal motion, by the operator, whlle, with his left hand, he grasps a cam lever, and forces the movable jaw and head toward the other and upsets the tyre. The anvil is fastened between the two bars, and the tyre reats thereon. In case it bends upward, it may be forced down with a

Darld Mosman, West Mertdened Door Bell.
standard attached to the door. The standard is made with an offiet and to its angle is pivoted the hammer. The short arm of the hammer projects down into a slot in the shank of the staudard, and to its end 18 the inner part of the rod is a nut, which strikea anginat the base of the
bracket to 11 mitt the movement of the rod, and thua regulate the force with which the hammer strikes the gong. A washer prevents the sald nut from beln
ousolon,

George C. Crum, Barr's Store, Inl. - Thts inven
very almple mode of opening a gate from the back consists in a novel and
Improved Carriage Curtain Fastening.
nith and Dantel $\mathbf{H}$. Rhodes. Hempstead, N. T.-This
John Bannihr and Daitel H. Rhodes. Hempstead, N. F.-This invention lable to become accidentally unfastened. Small slotted metallic plates are attached to the curtain at sultable polnts on the sides and bottom. These slip over buttons which are plivoted to the frame. The latter has a concave outer edge into which the inner rounded edges of the buttons itt,
so asto press the curtain down in its place. Securing the button,after the o as to press the curtain down in its place. Securing the
sotted plate is silpped over it. holds the curtain securely.

Improved Universal Joint.
Hiram Pitcher, Fond du Lac, Wis--This incention relates to apparatus
asedfor conveying power and motion by means of rods from the to the machinery driven; and it consists in a universal jofnc formed of cup plece and a head plece, with intervening rollers. The outer ends of the rollers are made contcal, to prevent undue friction. The rollers re-
volve independently of each other as they are touched by the head, and volve independently of each other as they are touched by the head, and
thisallows the two coupling rods to be placed at an angle with each other without increasing the friction. The parpose for which this jotnt is more esp.
machines.

Improved Vebicle Wheel.
Benjamin Pearson and Horace W. Pearson, Newburyport, Mass.-The joint is made so far from the middle of the space between two of the spokes he ends or making the joint on a bevel, the other segment is caused to art the key of an arch on the other segment, and be thus supported. Whlle the joint is made beveling, the bolt is passed through at a right angle with
the felly, and through the center of the bevel jolnt. This position of the
bolt prevents lateral moven doweling the ends together.

Improved Shoemaker's Shoulder Tool.
Wham L. Peters. iace.- This invention consists of a shoolder tool for smoothing and fintsh-
ing of the faced disks of hardened steel are combined with the rubbing blade, so as to scrape, smooth, and finish the edges at the same time the rabber is usen.
The disks are adjustably attaehed to be shifted around as they wear duli, interchangeable for soles of different thicknesses
lmproved Mechanism for Actuating Punches.
Warren Lyon, Mamaroneck, $N$. Y.- Ais invention consists in a wheet projection upon lis side, fitting into sald notches, and a loose collar, in
combination with the gearing by which the machine is operated. By opeating the lever the wheel is turned in elther direction, which gives motion o the gearing. The peculiar construction of the lever and notched wheel
enables thesaid lever to be readily shifted at the end of a stroke to obtaln a new purchase, so that immense power may be applied by a series of tuc cesilve efforts untll the desired effect has been accomplished. This power,
when appled to a punching press, enables the punch to de readily forced保
Improved Operating Mechanism for Hatches.
Willam S. Harris, Brooklyn, N.Y.-This invention relates to the hotsting and lowering apparatus employed for simultaneous opening and closing s
series of hatch covers by a windlass or other power; and it consists of the ope, chain, rods, or other device employed for connecting the hatch corfrom the topmost downward, and passing through a notch or eye in then,
of peculiar construction. There is a knot above and below the covers, to prevent the rope from running through the eye without effect, said bnot belng placed such a distance apart as to allow of such little play of the
rope as may be needed to each cover. The object ts to eliniplify the William E. Hill, Erie, Pa.-This Ls an Turner.
William E. Hill, Erie, Pa.-This is an improved log turner, whith is applied to the log, and the rolling motion of the log is produced by the con
tinuous motion of the spur wheels without tearing or injuring the same while allowing at the same time the immediste interruptinn of the rollitg and the placing in position of the log for sawing; the rolling mechantsm is
then carried back to rest on the supporting frame out of the way of the aw. Wheels with pivoted spurs are provided for simultaneously ralifis and rolling the log, n hich wheels are keyed fast to a shaft turning in bear-
ings of a shild-llike frame, which incloses the gear wheels and brake ported on a supplementary cushioned 1 ng, with 1 ts \&purred wheels, is supdriving power by suitable lever mechanism, which carrles the wheel up
toward the log. The orake is applied by a yoke with eccentric, band, and ever conchion to the upper wheel, its lever serving the twofold purpos of operating the brake and forctng the log into exact position for the saw Improved Music Loat Parner.
George sweatt, Lebanon, N. H.-This invention consists of fingers, for one above another, on a vertical plvot in a chamber, in or below the muste board, along which a toothed bar is made to sllde for throwing the fingers, sald bar having a row of teeth for each finger arranged to operate them
auccesively. There are foot treadles, for sliding the toothed bar forward and backward with palleys, to be turned by them, and cords connecting ald pulleyo whe bar to move it by belng pressed on them, one read ight to left, and the other being to turn them baek again, when it may be required to do so. The music rack is adjustable forward and backward
relatively to the fingers. for turning the leaves, and is held up to them b pringe, so that the leaves belween are always held in the proper relatio to the fingers, whether the book be thick or thin.
James M. Wallis, Improved Portable Fence.
ences. One brace is set in an inclined position and extends to the top c the fence. The foot brace, the lower end of which rests upon the ground, is attached to the other brace, near its middle point. To the braces ne
attached vertical bara. When the stags a re applied to a rall fence, the foot brace is attached in such a position that it may support the bottom ralls of the fence at the proper distance from the ground. In this case two vertical apon each other athe ends of the rails of the adjacent panels are niacen mentioned other alternately. The top ralls are placed above the brace irs race and vertieal barfor the ends of the top ralls to rest upon.

## Improved Dumping Wagon.

Charles Campbell, Cambridge, Wis.-The hind part of the bottom is at tached to a roller, suspended under the box sides. The front end rests on a cross bar fastened to the box sides, and the rear end is held up by a hook.
The hounds of the hind truck are fastened to the cross bar. The fore part nd re bar, so as to be detached when the load is to be discharged to let the hind end of the fore part of the bottom down. The connection is made by a
taple which passes up through the bar se as to be fastened by a long rod staple which passes up through the bar se as to be fastened by a long rod
which slides in from tha side of the wagon box, so that it can readily be put which slldes in from
in and taken out.

Improved Apparatus for Puddling Iron.
Joseph Davies, Knoxville, Tenn.-This invention consists of two pudwith in a rotary furnace. It is belleved that, by the rotation of the hearth in this manner, the pudding toolsoan be worked by power in a simple way
because the fron fis brought to them by the hearth; and by uilog power becasse the iron is brought to them by the hearth
derven toole. ithe pudiler't labor is mu mb leaseaed,

## Tusiness and efersonal.

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The Catiechism of the Locomotive (which
is now beling pubishshed weekiy) in the Bsiliroad Gazette

 10 -wheeled, and Mogul Locomotive by the Ballwwin
 A practical Machinist, competent by expe
reneewould travel and sill machinery for some reepon. Removal-L. \& J. W. Feuchtwanger, of 55
Cedar St., have removed to 180 Fulton St.,two doors ubove Church St., New York.
 Furniture Men and osthers $-A$ new patent
couvertible cradle and crib: alio two other patents in a wood article. The whole or parts will be sold for a
small amount in elther patent. Reed Co., 335 Broad-

Chemicals, Drugs, and Minerals imported
by $\mathrm{L} \& \mathrm{~J}$. F Fecontwanger, No . 180 Fulton St.,removed from 35 Cedar St., New York.
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ary. Keystone Portable Forge Co., Phlladelphia, Pa.
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signals are sent to persons tin the various departments of the estabilshment. Cheap and effective. Splendid

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paratus for hoiteting and conveesing material by ron
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ond hand.
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nounced superior to all other brands by all who use them. Dectded excellence and moderate cost have made
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ment. Andrew's Patent, Instie page.
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tels, and
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 (the Selden Patent), ,for private and short lines-awarded
the First Premium (a silver Medal) at Clincinati Expothe First Premium (a silver Medal) at CInctinnat1 Expo.
sitlon, 871 , for " . Best Telegraph Instrument for private se" -18 offered for sale by the Mercht's m'g and Cow
truction Co., 50 Broad St., New York. P. $\mathbf{O}$. Box 496 .
Woolen and Cotton Machinery of every de
cription tor Sale by Tully \& Wilde, 20 Platt St., N. $\mathbf{y}$. Dean's Steam Pumps, for all purposes ; En sines, Boilers, Iron and Wood Working Machinery of
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Parties needing estimates for Machinery
of any kind, call on, or address, w. L . Chase $\&$ Co., 3,959 Liberty Street, New York
Dickinson's Pacent Whaped Diamond Carbon
Oints and aduastable holder for worktng Stone, dreses Emery Whecle, Griodstones, wo., $\in$ A Nasean st.,N. $\mathbf{F}$. Stean Fire Engines-Philadelphia Hydrau-
Sc Works, Phlladelphia, Pa. Bone Mills and Portalle Grist Mills.- Send
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for packing Lard and other olly substances, Cnloride of
 sicated Vezetables, shelf Papers, and all applications
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Agents of new and saleable mechanical novelties, acadress rames H. White, Newark, N. J., Manufacturer of Sheet Paragon Gold Quill-Pens-The best in use.
c. M . 1 her $\&$ Co., 102 Fulton Street. New York. Emerson's Patent Inserted Toothed Saws,
snd Saw Swage. See occastonsl advertisement on out. Ide page. Send Postal Card for circular and Price List. Spools, Button Molds, and all .
Stall turned
sood made by H. H. Frary, Jonesyllie, Vt.

T.D. W. can best adjust the pea of a scale explanation of the wire rope and sheave mystery on $p$.
191, vol. 29.-J. H. Will find directions for waterprooning canvas on $p .122$, vol. 27 . Varnish for chromos is de.
scribed on p. 164, vol.27.
$A$

 6.-W. W. P. Will find that marine
D.202, vol. 38 , wll answer his parpose
A. R. B. asks: What elements are removed
rom the soil by the growth of cabbage? A. The outer leaves of perfectly ripe cabobese arec composed of albu-
minous substances, 1.16 per cent, woody fber, gum, and sugar, $5 \cdot 0$ per cent, ash,, $2 \cdot 2$ per cent, water, 911.1 per cent.
The heartleaves contain a ittle more water, and a lit.
 the soll. These acclds are In combliation with the varl oas bases which are absorbed by the growing plant.
A. L C asks: 1 If I take a tube of suita A. L. C. asks: 1. If I I take a tube of suita-
ble length and dismeter, and on one end put a dobble convex lens of about 6 inches focus, and in front of this
end a mirror, at the other end a triangle, is there any end a mirror, at che other end a triangle, is there any
way by which I can project that triangle on to the mir.
ror, so that I may be able to see it from the ontalde? A. ror, so that I may be able to see it from the outside? $A$.
Not when arranged in the manner stated. 2. Can you give me any information in relation to the difierent speBanks of Newfoundland? A. See the reports of the exploring expeditions sent out by England and the Un1--
ted States Government. 8. What is the beat theory on ted States Government. 8. What is the beet theory on
the phys'cal constitution of the sun? $A$. The sun is supposed to consist of a central solld or Ilquidmass,
which is surrounded by two or more shells or envelopes Which consist of the vapors of the varioas metallic and other bodies conatitating the sun, and of gases, especi-

 aqueona ammonia 18 soured apon arsenious oxide. It
exitats only In contact with ammonia, quickiy giving ofit ammonia in contact with the alr. It forms a yellow can Iotatin in an evaporating dish on an oval copper
water bath overa Bunsen burner? A. You cannotob
 may be. 3. What are the specinc cravity, hardnese, and other mineralogical propertles of borate of llme?

 gray or green, and somettmes milk white and tranaln and redilinh nt concenprtict. stripes. Betore the blowplpe It awellesinto a mill-white mass and then melts into 2
tranapprent glase, colories, or somettimes pale rose colored. It is composed of lime, silex, boracic acta, and
J. T. asks: 1. What will dissolve ultrama
Hine to make writing nuld? A. Ultramarine can be sas pended in a mucllaginous iquid, 111 ke ordinary mucllage, for the parpose you mention. 2. Will solabie glase dry on an iron sarface exposed to friction? A. We do no

S. B. says : 1. We have a cellar heater,
with three hot air pipes beating ive roms one of the Ith three hot air plpes heating ave rooms; one of the pipes run Inta a flue . Which heats two rooms on the
Arret foor and one on the second floor. There are no fret foor and one on the Becond Hoor. There are no
dampers In the hot ar plpes or in the fue. When we
want all the heat in the two rooms on the first hoor, we close the registers on the other plpes and the upper par: of the fue. which leaves a racuum in those pipes and
the fue. I think that, if we had dampers in plpes in the The fiue. It think that, if we had dampers in plpes in the register on the frrst IIoor, we should get more heat. A. A.
It 18 usual to provide dampers in the hot alr plpes near It 18 usual to provide dampers in the hot arr pppes near
the furnace in the cellar; and you would save some heat by having them, namely, that portion which escape
rom the pipe not used, by radiation from tt, and by the egister in the room not heated closes tight. 2. Can you inform me what the sizing that plumbers put on the plpes, preparatory to wiping
the jolnts, s made of? A. It is prepared with lamp. ager beer put into t .
A. B. asks: What is the value of antimo-
ay. what is its uge, and where is it mostly found? A. Alloys of antimony, with lead and tin, are largely used zinc, and 5 of antimony is used for sockets in which the steel or Iron plvots of machinery are at work. The gray nany, and ore is found in the Haryz in Corne, Hungary, and Borneo. The oxide of antimony is found in Algertaand
is smelted in France. Red antimony, which is a comis smeited in France. Red antimony, which is a com-
pound of oxide and sulphide of antimony, is found in Tuscany. The
be given here.
$\underset{\text { A. }}{\text { A. . F. F. asks: Wing a good quick dryer for oul paint? a recipe }}$ seed ofl 1 gallon, powdered litharge 2 lb ; ; simmer with
req uent stiring untila pellicle begius to form, remove he scum; and when it has become cold and has setlled E. L. D. asks: How can I remove enamel rom goid withoutheating? The enamel is the blue kind
ased for ornamenting jewelry. A. The enamel to which you refer, betng a species of glass, can be removed with
out heat by the action of hydrofluoric actd. This is huric actd aad then sprinkiling over it some finely pul verized fluor spar (calctum fluoride), by which means
hydrofluortc acld is set free and attacks the glass, the old not belng affected by elther actis. The guapshuric
actd should be sllghtly warm, and care taken to the fumes and getting the aclds on the hands, as hydro fuorte actd is very corrosive to the ekin. Several ap-
plications may be necessary. Wash off and dry after each application.
P. H. W. says: To heat water I placed a
apper tube in a coal stove ; the tube is 13 inches dee copper tube in a coal stove ; the tube is 13 inches deep,
$5 \times$ Inches diameter, with a bail made on the circle of ing raptdyeter. It was fllednearly full; and while boil ing rapldly, I attempted to take it out, but the steam was
rising so atast that I could not place my hand near to it.
Ithen poured then poured a inttle cold water into 1, which checke the ateam entirely, so that there was no visible steam
arising from 1t. I took it and set it on a cold plate of ron, where it stood 6 or 8 minutes, , then took it by the
bailagain, holding it two minutes. There was no sign of steam arising from the water, but as soon as I at-
tempted to pour it out, the steam burst forth in such volume that it was only with the greatest effort that
succeeded in keeping it from scalding my hand. Dit sue cold water remain on the top, and at a lower tam erature, condensing the steam, untll poured off? A. The explosion was caused by the power which water in a
quiescent state has of retainulng a large amount of
steam, and setting it free when shaken or suddenly agl-
$\underset{\text { my house, watching the chimney burning out, Inoticed }}{\text { F. M. . . . }}$ a stream of electrical ire or light passing on to the
point of the platinum arrow or weather vane attached on the lightning rod and passing off from the opposite
end. touched the pelnt of the arrow with my hand and the light ceased; on removing my hand, the electri-
cal current was again established. I reversed the arrow in direction, putting the polnt opposite to the wind again turned toward the wind and the electrical light was resumed again. At the time the wind was blowing
from southeast. rain and sleet were falling, and the barometer was low. The following questions arise: Does city is caused by the advancing clouds. 2. No light. ning betng seen, was this voltaic electricity? And if so
why did not the current pass from the arrow to the 1Ightning rod, and thence pass trom the arrow to the
ground Instead of connections of the copperse rod of the arrow ? All the end is nine feet in the ground, which is molst. The rod
near to and below the arrow is coated with soot from the chimney: would this prevent the flow of electrictity J. D. S. says: I am informed that there is be reproduced on prepared white paper. I belleve negative is prepared directly from the tracing, and after-
wards printed on the prepared paper by exposure to the wards printed on the prepared paper by exposure to the
sun. What solution is used, or how is the negative ob of the $P$. The drawing is properly mounted in fron of
manner. This negative is then employed tor usalar W. says: In Dr. Hayes' " Open Polar Sea,"
he states that he procured suffictent fresh water for the crew of his schooner by bolling sea water in a common process to purify sea water? If so, what is the nse of pose? We hear of the crews of vessels perishing of thirst. Surely, if there is a simple process of purifying
sea water, it should be made widely known. A. There is no difficulty in procuring water freefrom saline mat ter in the manner described. But water, so distilled, differs from natural water by containing no alr and be ing free from certain small amounts of mineral matter which make spring water lively and palatable. The
G. W. asks: Can wood be petrified, and how
is it done? A. One method is: Atter the tree is felled. place the root end in a solution of sulphate of coppe and acetate of iron. After remaining for a few days,
the wood is completely saturated. Another method is to place the wood in a vessel from which the air is exhaus
ted ; sulphate of fron or alum solution is then let in and pressure applied. The wood is then partially dry, and
afterwards it is treated with a solution of chloride of calclam in the same manner. Or the wood can be im.
prognsted with water glass, and then treated with an
aild.
C. .. Y. asks: Can metallic zinc be obtained
rom the muriate of zinc, or can a coating of zlinc be ds osited on Irite or or other metal from the murtate of Inc ? A. The murlate of zinc has been emplayed, but
G. C. H. says, in reply to J. N. W.'s query
to the excrescence on the plank: The board was re cently brought to Utica and shown to the sclentilct men
of the place, among others to Mr. s. W. Cububuc. He mediately sald that it was the result of compression Ine, latd it upona block of fron, and struck it one blow ith a hammer. It wasthen placed in a vise and sawn down through the edge; Immediately the compressed
wood bulged out and assumed the shape it now has. aclose you the plece. Ithink that the orlginalone cur eaccounted for in the same manner. The rree elther thus Indented at that spot, or the board has been wase. pared for a joke. A. Mr. Chubbuck has certannly suc-
ceeded in productng an appearance similar to that of J . S. asks: How thick is the earth's surface or
crust ? At what depth in tile earth willit be hot cnough to fuse all known substances? A. It is ascertained that
at a depth of a very small proportion of the earth's dieter, all known substances would be in a state of $f$ ion. Experiments made at Creuzot, France, led the ob servers to beilieve that, at a depth of
would reach 4,600 Fah., more than suffictent to melt
ander
E. E. asks: What can I use to make a joint terem tight? A. Use ecqual parts of white lead and red
lead, and add as much bolled $11 n s e e d$ ofl as is required ead, and add as
o make a putty.
G. N.-Animal vaccine virus can be ob-
ained st all times and in any quantty from Frank $P$. oster, M.D., Director of Vaccine Department, New furnishedin three ways: On sllps of quill, costing each
25 cents; in capillary tubes, cosing ${ }^{*} 2$ each ; and in enIre crusts, costing \$2 each. The tirst is the most handy within the power of every one to vacclnate: Bare the
arm to be vaccinated to the shoulder, and, taking a large inedle, scratch the skin two inches below the shoulder
in cross lines untila a place the size of a three cent piece looks watery; then dip the quill into warm water for a econds. Allow the arm to remain bare for some min utes until the spot seems dry. Each quill to sumplent
for one person; but the capillary tube contains suffictent virus, in a liquid form, to vaccinate ten or twelve perupon a knife blade in mirute quantities at a time, and rubthe knife blade upon the spot prepared as before de-
scribed. The crust may be macerated in waterand then pplied. Virus is prepared for use in this way: When
the pustule upon the cow is full of matter, the small quills are dipped into it, allowed to dry, and rolled in in foll. The capillary tube is simply a very fine glass
ube, one end of which is dipped into the matter ; the marter will nearly fill the tube, by what is called capil-
aryaction of the tube. Then the portion of the tube with with matter is broken off, the two ends sealed ransportation. Vaccine virus from the cow is the pur-
sit and most efliclent known, tirst, because young and althy helfers are the only animals from which the viained fresh hrom the physiccian above mentioned. A letter, addressed to him enclosing 25 cents or $\ddagger 2$, will be We.-S. H. C., MLD.
W. H. J. asks: Will a siphon draw water
feet high, if it had 150 feet fall? A. No. The rise of M. C. asks: Is there any machinery for in dwelligg houses? A. Y Yes. Water enginges and smanl
turbine wheels, for driving sewing machines and other arbine wheels, for driving
E. L. S. asks: 1. Is it possible for gas to escape from a burner when lighted, unconsumed? A.No.
2. Is it the revolution of our earth which produces the mosphere? ach as the trade winds.
$\underset{\text { D. C. S. asks: Has heating with hot water }}{\text { dited }}$ Armas in this city who make heating by hot water a spe-
cialty, as also some in the other princtpal seaboard ctt. ver, of heating by this method is fully as great as that
E. M. B. asks : 1. What are the most power-
ally explosive substances or compounds known, that an be obtained in large or inexhaustible quantities? . Gun cotton, nitro-glycerin, dynamite, and dualln. power to 5 parts of ganpowder; 1 part of nitro-glycerin
to 8 parts of gunpowder. 2. Which of said explosives or parts of gunpowder. 2. Which of sald explosives
re the cheapest per unit of explosive power? A. Ni. are the cheapest per unit of explosive power? A. Ni-
ro-glycerin. 3. Which of said explosives burns or exlodeswith the least smoke or ashes? A. Gun cotton ould leave no residue. 4. Is there any treatise upon
xplosives that will pive me all the known properties the princlpal explosives? A. See our advertising
G.S. R., H. B. G., and others question the
ccuracy of our answer to W. L. N., in which we stated that tit is not a fact that all matters that form seale in a lime are precipitated from solution in water as the tem-
perature increases, and the carbonate of lime, belng perature increases, and the carbonate of llme, belng
Ight, rises to the surface of the water, if there is a ood circulation in the boller. The sulphate of lime, Which is heavier, sinks almostimmediately after precip. apidly as the temperature of the water increases. When the boller is not in use, the partlcles of carbonate none different parts of the boller.
C.P. H. asks: How many pounds of nitrate of ammonta would be required to reeze a gallon of wa-
ter ? A. Theorettcally, nearly 4 lbs . When the temperature of the water $1868 \circ$ Fah., but in practice a larger
quantity, owing to the absorption of heat from the conJ. G. H. asks : 1. Can sugar be kept liquid
y any chemical process? A. No. 2. How can copying any chemical process? A. No. 2. How can copying
nk be made from common writing ink? A. By the adopy, the same as copying ink? A. This can be casily

 panad the 0.01513






 uary 1,1874 ? $A$, Not exactis.










 these are plated with ost of of silver to the prose, ouble
 in proportion, according to size. S. What book do you
recommend for traveling electroplaters? A. Rese.
leur's "Galvanoplastic Manipulations" is a standard leur's " Gal
authority.


 ene Record for $1884, \mathrm{p} .20$.
N. A. M. askg: Can you give me a recipe


 lb. of concentrated and purifed glycerin, having a den sity of at least $30^{\circ}$ to $31^{\circ}$ Baumé care belng taken to
stir constantly. The mixture is left to stand for some tir constantly. The misture is left to stand for some
time, and afterwards poured into five or six times its bulk of very cold water to which a rotatory motion
has been imparted. The nitro-glycerin sinks to the bot om as an olly liquid.
C.S.D. asks : I. Where it the largest re-
fractug telescope in the world, and what is the size of its object lens? A. Atthe National Observatory, Wash
ington, D. C.; diameter of lens, 26 Inches. 2. I wish to connect anether boy's home with mine by a telegraph wire, and (as it is not conventent to have it suspended
from the one house to the other) I want to know if I tar
copper wire and put it under the sidewalk (fastened by staples), if the tarred wire will answer the same pur
pose as insulated wire? And if not, what can I put on the wire that will? A. Use an ordingry insulated gutta
percha telegraph wire. 3. I have a blackboard on whtch it is difficult to leave any mark. What substance shall put on it to remove that difficulty? A. Put on the black
board liquid sold by most stationers.
R. E. W. asks : Is there any way of making potash and manganese? Nitrate of soda is much cheap.
er ; cannot its oxygen be driven off? A. Nitrate of soda is readily decomposed at a red heat, and ylelds orygen Which at ifst is tolerably pure, but becomes
ted with increasing quantittes of nitrogen.
A. B. asks: Is the white soft matter in the
center of a corn kernel pure starch? A. It consists of morethan 50 per cent of starch. The remainder to wa
K. K. K. asks:
be prepared in large
quantites, cheaply, rapidly, and with stmple apparatus, similar to a hydrogen generator,
so as to de instantly ready? A. By heating nitrite of
F. H. M. asks: Is there any sure way o
riding an old house of bedbugs, cockroaches, etc. ridding an old house or bedbugs, cockroaches, etc. use strong mercurtal olntment, soft soap, and oll of tur
pentine, in equal parts, triturated together. If they ar secreted in the timbers, fumigation by burning sulphuy is the best method. For cockroaches, make polson wa tle muctlage : spread out thin to dry.
W.S. X. asks:
in small quantites?
$\Lambda$. Lard can is chiefly obtained as a secondary product it the manufacture of stearin. It is puriffed first by agitation with sulphuric acid, and a terwards by steaming it or washing it by water. 2. Is
there a polish that will adhere to such articles as a tin lantern of which the tin 18, w.
made? A. See p. 315 , vol. 29.
G. W. W. asks:
pared for oll painting?
A. The canvas must be stralned on a frame of thoroughly seasoned wood, so as not to
shrink , and a thin oll tiling must be put on till the tex ture of the canvas is completels
and projections must be avolded.
J. A. M. asks: How can I smooth and pol
1sh a plece of rough marble? A. Use (1) wet asndstone ish a pece or rough marble? A. Use (1) wet sandatone
(2) a plece of unglazed pottery (also wet), (3) pumiee stone, (4) lead fllings and rouge, (5) a little powder
Z. P. B. asks: 1. What is the best substanc
with witch to clean common and undressed kid and dogsikin gloves with, and how is it applied? A. Damp
them slightly, stretch them gently over wooden hands, and clean them with a sponge dipped in benzole. A soon es they are dry, withdraw the hands, and suspen
in the air till the smell has passed off. 2. What is the best to clean trory with? A. Ivory can be bleached b exposing it to the fumes of burning salphar or to chlo
ne gas. In answer to your other question, consult a cy ine gas. In answer to your
clopædia of manufactures.
C. W. H. Jr. asks: How can cloth or velvet
be made to stick to cast iron? A. Try painting the iron with ofl paint, letting it dry, and then attaching the
A. A. W. asks: How can I make bisulphide on more cheaply than you can mate it inde of ca bon more cheaply than you can make it, as it is now
manufactured on the large ecale. The following appa ratus, nowever, mas be sufficlently simple and cheap for your purpose: Bore two holes in the top of an iron
bottle, such asmercury ts imported in, and into thes

and the other bent. The bent tube is connected witt
another tube leading to the bottom of a bottle filled another tube leading to the bottom of a bottle fille
with ice. The fron bottle is fitted into the top of a fur of the flame. The furnace should have a hole in its to
ither so that the bottle may fit snugly into it, and the top be protected trom the fire. The bottle is Alled two thirds
full of pleces of fresh charcoal; and when hot, a few fragments of sulphur dropped a t intervals into th
straight tube, which 1 immediately closed with a plug The blsulphlde of carbon is condensed in the bottom or the ice bottle, and stnks to the bottom of the water. I
should afterwards be rectifled by carefully distilling in should afterwards be rectified by carefully distilling in
a hot water bath, in contact with chloride of calctum, and condensed as before. Bisulphide of carbon is very
volatlle and infaimabie, so that care must be used volatile and infaimma
making and handlin"
N. H. F. says that J. P., who asked how to prevent a wooden screw from checking, should boil it in
water with a ittle salt in it. It will then never chect or crack.
$\underset{\text { H. G. B. says, to M. B. C., who asked how to }}{\text { to }}$ You need no air at all, ath consequently have too much
ready. Airis good for respiration, but was not mad ora drying agent, although it is well adapted to pre ent too raptd desiccation. And alr-dried lumber has rust of dried wood on the outside, which retards the the wood, leaving it liable to swell or shrink with ever change of the weather. Again, air cannot season lum er, which operation is a chemical change of its albu en, preventing its future shrinkage, swelling, and de cay. Even eggs can be so coagulated as to keep for
years, and inave some, ihas prepared, which are thus old, as perfect as ever they were as far as decay is con-
cerned. It was (and still is) thought that the best was of preserving lumber was to extract the albumen, by
soaking the lumberin water for 6 or 12 months, or by oaking the lumber in water for or good work and good finish. The albomen should be coagulated and retained in the pores of the wood, and will keep out water ordamp air as well as if the pore were filled with shellac or other gum, evidentiy fitting readily accomplished by the well known means of dry steam, requiring fewer days for its eompletion than the
soaking and subsequent drying does months. In fact soaking and subsequent drying does months. In fact
it pays well to subject all lumber, no matter by what which a black walnut tree may be cut in the forest on honday morning, and worked into furniture by Satur ay night, and be better fortified againat any tendency ter finish.
H. P. says: If W. D. B., who asked as to
flow of oll from a wick, will lower the inghted, below the top of the wick tube, the oll will not
spread over the out alde of the lamp, which is the case with some, if not all, ofls when the wicks protrude ou
J.E. D. says, in reply to several correspon lass is free from dirt and grease; then with mytongue hics the place where I desire the figure or letter to b and then press the dampened surface upon a plece of
oold lea of sufflent size, taking care to have it smooth nd unbroken. Afterit has dried (which is indicated by ts assuming a pollshed appearance), I place it over a
marked board, and with a sharp instrument and ruler cratch lines for the top and bottom of the lettera, and hen (with quickly dryinglmaterial) paint the letters, rom the other side. When the paint is dry. I rub off the
uperfluous leaf and the job is done. If the work ts to be done on large giass.11ke store windows, it is better to paint the letters frst on the outside, as they are to ap-
pear, and this will show where to apply the leaf, and also pear, and this will show where to apply the leaf, and also
how to paint on the inside, as the paint will show plainI through the leas. When the job is done, the outside sons to paint the letters backwards, to mark them with pen and ink on paper,and, after olling the paper, look at
P. H. B. gays, in answer to W. W. S., who asked how a 20 horse power engine can be started and
stopped by telegraph: If it be a single engine, it would and the steam plpe and the steam chest would bave $t_{0}$ be well provided with drip exits ; and the throttle valve must be easily worked and well balanced. The throttle ever conld be actuated by a magnet, or by weights and
mechanism similar to that employed to trip the hammer in apparatus for striking the fire aldrm telegraph bells
in cities. A double engine could be so arranged as to

 grow faster than it naturally would: The following
rectpe is perfectly harmless, and will make the beard grow like mashrooms in a hotbed: Cologne2 ozs., hiquid artshorn 1 dram, tincture of cantharides 2 drams, oil of rosemary 12 drops, oll of nutmeg 12 drops, lavender
12 drops. Apply to the face dally and walt for the re-
sult.
T. A. C. says, in an answer to J. P., whose
query about seasontng wooden screws is answered on query about seasoning wooden screws is answered on
p. 219, vol. so : Borea hole longitudnally through the
centerof the screw
 of the wood, the sap escapes therefrom, the center of
the wood contracts, and the strain on the outalde 18 lesthe wood contracts, and the stratn on the outside is les-
ened. of course, the larger the hole, the better for the eened. Of course, the larger the hole, the better for the
seasoning process; but it thould not, and need not, be aition, yon can boll the acre fin the fob will be bettered; if boiled in ofl, it willbe complete.
J. H. P. says: Tell G. C. B. that cracks and holes in cast iron kettles can frequently be fllled by ce-
ment composed of glycertn and litharge made into a ment composed of glycerin and litharge made into a
stiff putty. It requires 3 or 4 days to harden. I have
filled holes in tetles filled holes in kettles an inch or more in dlameter with
this cement, and used the kettles for years afterwards.
C. D. S. says that R. H. F. can test squares
with the dividers by drawing two circles one witnin the other, from the same center, of 16 and 12 inches diame-
ter respectively; then set the dividers to 10 inches, insert on pointin any part of the outer circle, and mark
the point exactly where a clrcle (drawn with the divid the point exactly where a circle (drawn with the divid-
ers io chis position) would intersect the inner circle now draw a straight line through the center of the circles and through the point marked in the inner circle; and through the outer one, another line starting from the point where the dividers were inserted in the outer
circle through the center of the circles untll the outer circle through the center of the circles anth the outer
circle is reached. If this is done exactly, the polnts Where those lines intersect the outer circle will form
the corners of a perfect square whose side is $11: 8187+$ Inches. If the a puare is correct, it will it the square Thus formed and also the lines in the center, which diIde the circle into 4 equal parts, and the angles must
be 90 degrees. This is based on the rule for finding the hy othenuse of a right angled triangle, thus : $6^{2}=86$ and $8^{2}=$ 64, sum 100 , the square root of which is 10 . This is some.
times called the 6 , 8 , and 10 rule for squaring bulld-

Minkrals, fic.-Specimens have been received from the following correspondents, and examined with the results stated:
D. H. E. - This mineral is compact soapstone.
D. B. - The mineral resembling gold, which is inclosed dhe quartz, is iron pyrites.
na and iron. The red stone is quartz rock, colored by a
ittle oxide of tron $\boldsymbol{E}$ oxde of iron. The gray one to mile
E. L.F.- Your specimen consists of cublcal
of iron pyrites, inclosed in gray quartz rock.
B. B. S. - Crystals of iron pyrites, inclosed in talcose
H.S. B.-Your specimen consists of a solld mineral portion, and of volatile substances, the latter amount
ing to $1 \% 76$ per cent. Glves off water and olls on heatug. The residue left after heating consists of silliceous grains, colored with oxide of fron. Containa a small
mount of soda but no potash. We do ase for it other than that of soap, and we can assign no value to tt .
O. K.- Your sample of safety powder for use in pe-
coleum ofls consists of salts, mostly common salt troleum oils consists of salts, mostly common salt,
Which have been dyed yellow, blue, and red in order to disgulse their true nature. It is worse than valueless. nos not diminish the explosive nature of the oris,
and injary.
R. S. asks: How can I remove the inside -V.V.V. asks : What must I use ito paint show cards with? The ofl in ordinary paint discolors the card around the letters. I want something that paints very S.ack, aliso white and light tints for dark grounds?-G. asks: What is the best way of removing tallow and white lead that has been applied to polished parts of:machine
ry to prevent rust?-W. H. D. asks: Does powder of a coarse grain shoot more strongly than one of a fine
grain ?-M.F. B. asks : 1. Which will shoot the greater distance, a breech or a mazzle loading shot gun? 2. Is 30 inches long enough for a gun of 10 gage? 3. What
are the different strengths of the materials used for gun barrels? 4. Is Damascus twist as good as lamina
ted steel for gun barrels? - P. J. F. asks: 1 . What is the ted steel for gun barrels ?-P. J. F. asks: 1. What is the
proper chargeof powder for a No. 12 callber shot gun?

## 2. How much po without waste?

## COMMONICATIONS RECEIVED

The Editor of the Scientific American
acknowledges, with much pleasure, the re ceipt of original papers and contributions upon the following subjects
On Kepler's Third Law. By A. L.
On the Elasticity and Slipping of Belta By J.T. H.
On a Scientific Toy. By E. L.
On Ascertaining the Width of Streams By J. C.
On the Manufacture of Leather. By D. S On Car Building. By N. E.
On Light. By T. H.C.
On the Attraction of the Sunand the Earth By H. K.
On Ventilation. By E. H. S
On the Canal Problem. By J. H.
On Foaming in Boilers. By G.C. P
On Shellac as a Dressing for Wounds. By . W
On Squares. By M. T. C.
On Spiders' Webs. By C.T
Also enquiries and answers from the follow-
ing:
P. T. F. - F.H. - J. R.P. - W. H. C. - T. H. F. - J. W.
T. C. $-\rightarrow$ E.
W. H. - P. S. - J. L. - F. H. E.

Correspondents in different parts of the country ask
Who sells a machines for testing the strength of th
arm by striking a fiat surface? Who makes jlg gaws fo arm by striking a fiat surface? Who makes jig saws for
catting out ship timbers? Makers of the above article will probably promote their interesta by advertieling, in reply, in the econitipionicisioas.
Several correspondents request us to publish repile
their enquiries about the patentable ventions, etc. Such enquiries will only be answered in letter, and the parties should give their addresses.

Correspondents Who write to ask the address of certain manufacturers, or where specifled artclese are to be had also those having goods for sale, or who want to find
partners, should send with their communications an amount sufficient to cover the cost of publication under the head of " Business and Personal," which is spectally devoted to such enquirles.

## [OFFICIAL.]

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Furnace grate bar, Wren \& Meyrick.
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| ings upon the respective applications are appointed for the days heretnafter mentioned: <br> 29,012.-Horse Rake.-F. Seldle et al. June 17. |  |
|  |  |  |
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| 29,012.-Horse Rake.-F. Setdle et al. June 17. 29,035.-Sewing Machine.-J. First. June 17. |  |
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|  |  |  |
| 29,790.-Cattie Tir.-G. Hull. August 12. |  |
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York city, U. s. Improved comblnation steem, water
and gage cock, called " Holland's Combination Safety and gage cock, called " Holland's Combination Safety
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tograph Card." April 4, 1874. S,275.-D. LarerandS. E. Griscom, Borough of Pottsville,
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mond millstone dressing machines, called "Larer's mond millstone dressing machines, called "Larer"s
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