THE DEPRECIATION OF FACTORIES， By Efing Mataeson，M．Inst．C．E．

The deterioration of a factory by time and use，the appraisement of the loss and its due allotment in the accounts of the undertaking，are matters of great im－ or error will，according to its extent，render calculations of cost and profit fallacious．No fixed rules or rates of
depreciation can be established for general use，because depreciation can be established for general use，because
not only do trades and processes of manufacture differ， but numerous secondary circumstances have to be con－ sidered in determining the proper course．It may，how－
ever，be possible to lay down some general principles ever，be possible to lay down some general principles advantage be held in view in deciding particular cases． The question of depreciation cannot be separated from that of maintenance，and in theory one may be said to balance the other．In practice it is only in certain cases that this can be acted on．In any particular building， machine，or appurtenance，decay or wear of some sort
must take place in the course of time，and repairs in order to compensate fully for the loss must take the form of
renewal．But although this may be the case with each separate item of plant，the absolute replacement of some every year may maintain an average aggregate value．In
only two classes of undertakings，however，can such an exact balancing of loss and gain be ventured on．One， where the plant wears out so quickly as to need replace－ ment at short intervals，affording constant proof，by the mere continuance of working，that the earning，power of the factory is maintained；and in a second class，that of permanent undertakings so large as to afford a wide railway the deterioration of the fixed and moving plant is supposed to be fully and properly met by the expenditure for repairs and renewals，and so long as the working of the railway is kept going，no regard is had to a future
valuation such as might disturb the accounts of a manu－ valuation such as might disturb the accounts of a manu－
factory subject to a change of ownership or cessation of trade．When a railway has been in operation for many years and an average rate of expenditure as proportioned
to the revenue has been arrived at，such a method may be ound，but there is a risk that in the working the gross revenue may not be sufficiently charged with the depreciation due to it
The absence of any provision for future renewals is often excused by the small earnings of the earlier years，
but the wear and tear necessary to such earnings must soner or later be paid for out of revenue or from new capital；and though in course of years the expenditure for repairs and renewals must almost of necessity balance the
deterioration if the traffic is to go on，there is room for deterioration if the traffic is to go on，there is room for much error in the accounts of particular years，and in the allotment of charges．The temptation to treat as profit the surplus of receipts over expenditure，without al－ lowing for deterioration，appears to be often irre－
sistible．Thus in the case of a tramway undertaking in sistible．Thus in the case of a tramway undertaking in
its first years of working，a dividend may be possi－ ble ouly by writing little or nothing off the capital
value of the cars，the haruess，and the horses．This， value of the cars，the harness，and the horses．This，
of course，cannot lasi without the introduction of new capital，but even in undertakings long established there may be epochs of fictitious profits due to various which，when the result becomes evident，will involve a heavy expenditure for renewals，or it may arise from actual fraud in postponing expenditure，so as to show large jobbing purposes．There are railways where the dividend ncome and the corresponding value of the shares have luctuated considerably，not according to alterations in the real earnings，but according
Water supply companies afford another example of per－ manent undecial maner．It is not usual to write off in with annual accounts as presented to the shareholders any－ thing for depreciation；but renewals as well as repairs are effected out of the current revenue．In very large and ong established undertakings an average expenditure wil serves the purpose of a depreciation rate by charging the earnings of each year．But in the earlier years of work－ is usual to divide the earnings as profit，without setting apart a reserve for repairs．In the case of companies with sunk capital，not exceeding $£ 100,000$ ，the expenditure for renewals occurs at irregular intervals；but instead of providing for such outlays in preceding years，it is more usual when any considerable expense is incurred－as， ubsequent term of years．Of course，when this system has become well established and suspense accounts are always running，the effect on any particular year＇s income will probably not differ much from that of a regular
depreciation rate，but it increases the apparent profit of the earlier years at the expense of later years．In many rempairs and rewewal，even where no direct provision for
repais made，there is an indirect reserve Water supply companies are in this country almost alway established by Act of Parliament，and the mode of keeping accounts and dividing profits is to some extent prescribed． authorising particular companies，the conditions generally are those of the Waterworks Companies＇Clauses Con solidation Acts of 1845 and 1877，which allow i the discretion of the directors a reserve fund to be se years，when current profits do not allow the maxi mum dividend permitted by the special Act of the com－ capyita．This reserve fund can only be applied to its
carescribed purpose of equalising dividend，and cannot be
used directly for repairs；but it is obvious that if
the earnings of the earnings of a particular year are burdened with some heavy expenditure for renewals the latter are really
paid for out of the fund nominally applicable for dividend． paid for out of the fund nominally applicable for dividend．
But the establishment of such reserve funds is seldom But the establishment of such reserve funds is seldom
authorised by shareholders，except out of surplus earnings， authorised by shareholders，except out of surplus earnigs，
beyond 5 or 6 per cent．，and therefore by struggling or unremunartiver cent．， forward．Such outlay may be minimised by careful atten－ tion to repairs，but cannot be avoided．The permanent nature of the undertaking may disguise the unsoundness of the system；but it is one which，when adopted in private undertakings，is frequently a cause of with large
failure．In the case of prosperous companies with failure．In the case of prosperous companies with large
net revenue，and whose monopoly assures a continuance of net revenue，and whose monopoly assures aut liberally，and profits，repairs and renewals are carried out liberally，and，
in cases where the rate of dividend is limited by law， in cases where the rate of dividend is limited by law，
there is even a tendency to exaggerate the expenditure on there is even a tendency to exaggerate the expencititre o
this account，so as to disguise the real net profit，or to this account，so as to disguise the real net profit，or to
postpone a reduction in the price of water which profits beyond a certain limit might render obligatory
With gas supply companies alsoareservefund for renewals is not customary，and though in one sense they are per－ manent undertakings，there is not so secure a future as in the case of water companies．The plant used in the
manufacture and distribution of gas differs also from that manufacture and distribution of gas differs also from that used in water supply－more of it being of a kind to wear
out rapidly．Retorts and other parts of the plant of short out rapidly．Retorts and other parts of tre plae，and with due care these charges bear a fixed proportion to the earn－ ings；but when some considerable renewai capacity is and only the part which extends the earning capacity is
defrayed out of new capital，the remainder of the outlay， which only makes good the wear and tear of the past tells most unfairly on the current year＇s income，and postponement of the charge to future years is equally
unsatisfactory，if the deterioration which has called unsatisfactory，if the deterioration which has called
for it is really due to the work of preceding years But，as in the case of water companies，if the profits are large and the dividends are restricted to a maximu，the expenditure out of revenue for repairs and renewals，and even for whe and the accounts may be as fictitious in this direc tion as in the reverse cases above alludea ts．Recent legislation，however，has been directed towards the ensur ing of a fairer system，increased dividends being permited of the consumers and the shareholders is thus rendered more identical，so far as economy in management is concerned． In the case of a very large manufactory，where ther is considerable annual outlay for renewals of plant， as well as for repairs，such expenditure，if charged to revenue，may fairly butess safety is sought by allowing an ample margin－say by obviously increasing the plant every year－there will always be a risk that a gradual reduction in the total value of buildings or plant will take place，ulti mately involving considerable expenditure to restore to
earning capacity．The neglect of due provision for dete－ rioration may occur withon whore，win the the railway just cited the erning may be undeveloped，and no fund available from which to provide for future repairs．
It is seldom that any sound undertaking can avoid legitimate extensions，but an increase in capital value cannot be properly assumed unless the earning power is corresponding ratio．In a to disteven for those engaged in its aitur chargeable to capital and that due to past deterioration， and to those outside the management impossible without careful and skilful investigation，rarely attempted．Of curse，actual additions to the size of a factory may be
duly reckoned as increasing the fixed capital，but such an increase may be wholly or partially neutralised by the depreciation of the older part．It may be said that the success of many undertakings，and their survival through the vicissitudes of dull times and during radical altera tions in trade，have been due to the liberal charging to There of seeming extensions，
There are various methods of estimating the deprecia it may be said in regard to any of them that the object in view is to so treat the nominal capital in the books of account so that it shall always represent as nearly as possible the real value．The most effectual method of doing this would ff whateve everything at stated intervals，and to write egard to any settled rate．In this way the deterioration due to a period of arduous working，or to an average or idie year，might be properly allotted．Such a system time，trouble，and expense it would involve；and eve where stock－taking of protit and loss occurs every year，an annual valuation of the plant is considered impracticable and which it is my purpose now to investigate，is to esta－ be written off every year，and to check the result by com－ plete or partial valuation at longer intervals．

A Hydraulic Curtain．－Messrs．Clark，Bunnett，and Co．，of Rathbone－place，have fitted the new Lyceum．Theatre，in Edin
burgh，with a hydraulic curtain．The proscenium opening is over
30ft． F ． screens of wrought iron plates an eighth of an inch thick，forming
a double division，with air chambers between of 9 in．The top of a double division，with air chambers between of 9 in．The top
the curtain is rivetted to double wrought iron girders secured the curtain is rivetted to double wrought iron girders secured working the rams is laid on from the town mains，and with an axpenature of，cay be raised or lowered in fifty seconds．The
about tons．
means for working the curtain are in the prompter box，and the prompter，by simply moving a lever，can drop the curtain，thu
forming，with the proscenium wall，a solid fireproof division of the

THE CHICAGO RAILWAY EXPOSITION．
The rapid construction of railways has been such an mportant item in the development and colonisation of the ar Western States，that it is not surprising that the Exposition contained many examples of machines specially constructed to save labour and make cuttings，embank ments，and ditches in the shortest possible time．Among the various machines used for rapid railway construction by the Industrial Works of Bay City，Michigan appeared y the Industrial Works，of Bay City，Miohig，appeared to well designed，and presented some points of novelty． The crane and body frough ron bars，and tif together．The boiler is 9 ft ．high，and the outside shell being made of annealed steel plates $\frac{3}{8} \mathrm{in}$ ． thick．The tubes are of wrought iron with copper ferrule thick．The tubes are of wrought iron with copper ferrule outside where they ens in wth 9 in 10 more 10 in tral with two cylinders 9 in ．diameter and 10in．stroke，give power to either hoist the dipper or shove，or move th entire digger．The former is accomplished by means of a hain winding round a drum which is driven by gearing rom the means of a pith forwar xies，the he ． ， roor，and the the rang being directly to wis ro which runs round a horizontal veed whel heel or sho is andted to but one end of these cylinders， nd．the wire rope is always lept tant by an arrangemen f thel fors Som ploff dimers the smaller t of different The dipper f earth by a steam cylinder，which acts directly on it，the train of puiding the dipper being taken by a lone I－section beam sliding on the back of the cylinder．The dipper and beam rod a ristly br pin strain．The cylinder revolves in he piston of and trunnions through which it supplied with steam Stop motions are fitted for the supp movem is shut off to prevent the aran bein swor too far being overwound A digger of this construction has excavated and loaded into trucks 1200 cubic yards of hard clay in seven hour By taking off the nut at the end of the dipper piston rod解 nd rod swing as shown in our illustration and the machine can then be used as a travelling steam crane，and is thus shown in Fig． 26
The same firm exhibit a very powerful steam break－down rane，which is also intended to be used in renewing bridges，the new girders being easily swung into positio by a crane which is capable of lifting forty tons，o $90,000 \mathrm{lb}$ ．The jib is constructed with a central vertica plate and two side plates，each dished in the form of a emi－elipse，as shown on Fig．28．The jib plates are of steel，$\frac{5}{8}$ in．thick at the lower end and $\frac{3}{8}$ in．thick at the oute end．The pillar of the crane is of cast steel，and the jib carries two cast iron blocks or bearings fitting the pillar nd of the jib can be lowered for travelling，the inner end eing lifted by gear，which is not shown in the illustration， and secured by pins through the upper ends A A of raking inks．A hemp rope 23 in ．diameter is used for hoisting England．
The crane end of the vehicle is carried on no less than ight wheels，two ordinary trucks or bogies being place nder the ends of two I－section bars B，15in．deep．Thes bars are secured to the base of the crane pllar，but th教 wo trucks or bogies to radiate to the curves of a railway lates， quare in The cylinders are 10 in ．diameter by 12 in號 forty tons，and the maker＇s price in America is 8000 dols or about $\pm 1600$ ．Cranes of a somewhes silar pattern are much used in the United States，where derailments and collisions，or＂wrecks，＂as they are termed，are of somewha requent occurrence．
Messrs．Wilcox and Stock，of Toledo，Ohio，also exhibi a steam excavator，which is stated to be capable of excava ting 5 cubic yards per minute．The machine is mounted $f$ wo four－wheel trucks or bogies of ordinary form bearinual strength，the axles being $i n$ ．in diameterame is
 ourvosed of 12 in ．by 3 in ．by ${ }_{4} \mathrm{in}$ ．channel iron， 10 in by $\frac{1}{3}$ in r di 8 ．，to which tee irons are riveted．The lower sid f which is attached to a timber hande，ond a steel pinio gearing into this rack is driven through gearing by a smal double－cylinder engine attached to the jib．The main engines，which hoist the dipper or move the whole affai forward，are situated in the centre of the car．The dippe has a drop bottom，which is fitted with a self－closing catch，acting when the dipper is 3 ft ．or less from th ground．This bottom can be opened by a tripping rope in any position of the dipper，which will excavate to depth of 5 ft ．beneath the rail level，and discharge at radius，and the maximum radius of the extreme point of the sha maximum radius of the extreme poine an accomplish a tolerably wide range of work
The main pillar is of solid wrought iron 8 in ．diameter and is stayed laterally to projecting beams，which rest on screw jacks placed on blocks on the ground on ensiderable amount of stability is thus attained，while these projectin arms can be readily swung clear of the loading gauge by
up out of the wagon on the remaining bolt $B$. The bolts $A^{1}$ and $A^{1}$ and $B$ passing through a block timber, which is armly secured to the main frame of the car. The machine is self propelling, the main engines driving a pitch chain, which engages a spocket wheel keyed on the leading axle. The vertical multitubular boiler is 8 ft . high, and 5 ft .2 in . diameter, with 100 tubes $2 \frac{1}{4} \mathrm{in}$. external diameter, and 2 ft . 5 in . in length. The hoisting chains are of steel and the bearings of phosphor bronze, with white metal pockets.
The machine is said to be capable of excavating 1500 cubic yards per day, and can be used as a grab dredger o as a break-down crane. When put to the latter use, the dipper and dipper arm are disconnected by the removal is a single pil. The excavator when in working order 19 ft . high to over all, 16 ft . wide over the jack beams, and 19 ft . high to the top of the crane. These dimensions can be reduced for travelling to 14 ft . high and 10 ft . wide,
which is about the usual which is about the usual American loading gauge. Machines of this class are xtremely useful to railways America, and effect a large yards, doubling lines, and other work, which is often undertaken by the railway company and not let by contract. As such a machine can be converted into a breakdownorcivil engineers' department crane, most rail way companies could keep t in tolerably constant keep Messrs. Harris and Carter, of Terre Haute, Indiana show a very simple and effective machine for levelling ballast, or sloping cuttings or embankments, and npening ditches. Fig. 30 shows the machine folded up and not in use, but fit to travel, and Fig. 31 shows the machine ready for work. A species of long plough share s hinged to each of the sides of an ordinary platform reight car. The ploughs can be raised or lowered to any angle, and the car being drawn along, the ballast or ther material which has been dumped by the side of therailsiseffectually levelled to a width of 10 ft . 6 in . from the centre of the track. Different forms of shares can be attached for special purposes, such as ditching or sloping the edges of the ballast The whole machine can be managed by one mau, and when the wings are folded back, can be run safely on any freight train. It is said to perform its work eatly, and to effect a great saving in time and labour The American Railway Ditching Company exhibits a machine which has been much used, especially on Western railroads, for excavating ditches along the side of the track. The action of the machine is simple, and easily anderstood, and it is said to work well, especially in heavy mud, where hand labour is at great disadvantage. Two hand gear jib cranes are mounted on each side of an ordinary American flat car, carried as usual on wo four- wheel trucks or bogies. The hook of the front crane is attached to the front end of a horizontal bucket or scraper, the other crane being attached to the rear end of the bucket, which holds $1 \frac{1}{2}$ cubic yards. A horif the arm or outhger projects from each side of the car, near the front end, and the bucket is dragged along by a chain from the end of his outrigger. The depth of cut can be regulated by the two cranes; if the hind end of lowered the slightly raised and the front end lowered, the latter will dig deeply into the soil, and excavate a large ditch. The whole tive, and one of these or drawn by a locomocapable of of these machines is said to be capable of excavating the ditches on 100 both frack in ats. It is course used construction and for cleaning out and under ing ditches on railways already enlarg Wheel Scraper Company, of Mount Ple Western exhibits some wheeled scrapers for excavating t, Iowa, ling. These machines are very extensively and levelAmerica as a substitute for the spade, pickaxe, and America as a substitute for the spade, pickaxe, and along the ground by a pair of horses, the front edge of the scraper is depressed by the driver lifting thge of the shown in Fig. 32. When filled with earth the man in charge bears down on a lever in the rear and raise the scraper clear of the ground, see Fig. 33, page 201, a maintaining it in position. The scraper can be tipped by urning it on its axis by means of a pair of short handles, another catch keeping it tipped, Ther short itself is made out of a single piece of sheet steel, bent up in a curved form at the back and sides, and attached to an ron frame which is carried by an iron axle furnished with road tread wheels. It virtually forms a tip cart which loads itself. When used on hard soil, a plough is preiously employed to loosen the earth and facilitate the peration of the scraper. A simpler form of scraper, Figs 4 and 35 , has no wheels, but is simply dragged along he ground, an extra steel plate on the bottom taking the
wear, while a swivelling eyebolt attached to the whippl The railway track exhibed by the
Constre railway track exhibited by the American Railway and efficion Company, of Chicago, is also a very simple aid, endent labour-saving machine. As the road is pushed up to follow are roughly spiked down, a train is engine are laden with rails and sleepers, and the front car furthest from the engine is provided with a simple light derrick crane, which suspends on one side of the car and for some 40 ft . in front of it an inclined roller pathway. Another similar pathway is fitted to the other side of the car, but does not project beyond it. These pathways are composed of two vertical deal planks 7 in . by $1 \frac{1}{2} \mathrm{in}$., to the upper side of which are bolted small open-top Fig. 36. These rollers are of suitable width follers, see
are assisted by so simple and convenient a machine. Th pathways are hinged to the sides of the flat cars, and can e folded up out of the way when they are not wanted. on cars near the front fish plates, and bolts are carried required. A ballast train is tha an engine, and is partly emptied "dumpe" spot by the drop bottom doors on the ballast trumpe " chroug as they are termed in America and partly by a mean, well known in Engla being a tached by a steel rape plough on the rear cal detached from the train and moving ahead distributes the ballast on one or both sides of the track as requires th These and kindred appliances anale $A$ required to be extended at a small cost and with very and the results obtained bear testimony to the efficiency the apparatus emnloyed. As an example of the ney practice the Chic general waukee, and St. Pand road lately built a branc across the State of Iowa to Council Bluffs, a distance 260 miles in one season, work commencing when the frost was out of the ground and trains running ber the winter fairly set in Thi rate of progress is bette appreciated when it is con trasted with that obtainin in some of our colonies. In the Cape of Good Hope, fo instance, the main line lead ing to the diamond field though urgently wanted, ha been so slowly constructed that nine years have been consumed in making 280 miles of line which present few great difficulties, and a tunnel one-quarter of a mile in length being the only works of art upon the line.

## THE MARIEMONTAND

 BASCOUP COLLIERIES In our last impression we published some drawings, and gave some particular of the Mariemont and Bas coup Collieries, visited las he Institution of Mechanical Engineers. On page 204 and 205 will be found engravings showing an end view and plan of the pumpr sleepers respectively, and whole pathway is hung on ing engine, a side elevation of which will be found on brackets made of $1 \frac{1}{2}$ in. diameter wrought iron pipe, which page 204, and views of the vertical engine used in work are so secured to the sides of the car that they can be ing the man engine, a drawing of which appeared on readily unshipped to permit the car to clear the loading page 181. We now give the first portion of a description gauge when it is restored to regular traffic. These path- Guinotte, in which reference is made to our engravings :-
whilst Generat description. - These two collieries, whilst completely distinct as to working and manage-
ment, are united under a single head office. The ment, are united under a single head office. The
former owns a royalty of 1480 hectares ( 3650 acres), the latter of 2410 hectares ( 5950 acres); making a total of 3890 hectares ( 9600 acres). The number of workable seams of coal is seventeen, varying in
thickness from 0.40 m . to 1.70 m . ( 1.31 to 5.57 ft .). The coal is specially suited for steam raising and for household purposes. The total output is about $1,000,000$ tons per annum, divided equally between the two collieries. There are ten pits in the Mariemont, four in the Bascoup collieries. Many im-
provements in coal working have been invented or adopted at the collieries, of some of which a brief account will be found below. The central affice of the two societies, as well as the special office of the Mariemont Colliery, is situated at Mariemont; the special office of the Bascoup Colliery is at Bascoup.
T'he two are united by telegraph and telephone. In collieries of such extent as these, the multiplicity of workings adds considerably to the cost of management, and also renders difficult the mixture of coal which is often required by the purchaser. The so-
ciety have solved this problem by forming a central ciety have solved this problem by forming a central
point for screening, loading, and despatching. To point for screening, loading, and despatching. To
his centre all the pits send their output by means of a system of endless-chain haulage. To the same oint, which is called the Triage Central, are also connected the repair shops and stores of all descrip-
tions. This establishment was erected in 1873. The tions. This establishment was erected in 1873. The
ways extend on both sides of the train for several cars back, and as the supports are adjusted to give a slight ncline faling towards the front of the train, any rais or leepers put on the rollers at one end of the train, and set deliverion, travel forward by their own gravity, and are

track, who lay the sleepers at the proper distances apart on the road bed, and afterwards spike the ends and middle of the rail. As the sleepers are delivered by the projecting It ean path, they can be laid down in advance of the rails. easily lay one mile a day for a year gang of fifty men will
many years about Burnley and elsewhere, and largely used on the Continent, has nowhere been applied on so large a scale as here. It
consists simply of an endless chainlying on the wagons and passing at consists simply of an endless chainlying on the wagons and passing at
one of its extremities round a driving pulley, and at the other round a return pulley. Originally the driving pulleys were in cast iron, with recesses in the circumference to fit the links of the chain. This system has serious disadvantages. As the chain lengthened in work, its links no longer fitted into the recesses; hence came slipping, violent shocks, and rapid wearing out both of the chain
and of the pulley. M. Briart has completely remedied this by and of the pulley. M. Briart has completely remedied this by
screwing into the rim of the pulley movable steel grips, the position of which can be altered by a turn of the screw so as to suit the lengthening of the links. The establishment of this automatic hauling compelled the installation of a complete plant for emptying and classifying the coal, and for loading it on trucks,
giving it at the 'same time a thorough cleaning. Olassifying has been carried out by the employment of screens with movable gratings, invented by M. Briart. Every system of screening must satisfy the following main conditions: (1) The different classes of coal must be completely separated; ; (2) The coal must be preserved
from breakage ; (3) The work must be rapid and cheap. Ordinary from breakage; (3) The work must be rapid and cheap. Ordinary
fixed screens placed at an angle may satisfy some of these conditions, but not all. If the angle is small, the coal does not break, but the separation requires a considerable amount of manual labour. The work is also slow, and the screens, if the output is large, must be very numerous. If the angle is high, the coal falls
more rapidly, but it thus gets broken, and the proportion of large more rapidy, but it thus gets broken, and the proportion of large

EXCAVATING MACHINERYAT THE CHICAGO EXPOSITION.

(For description see page 199.)


perfect. Various systems of screening have been invented to over-
come these difficulties. In England and Germany cylindrical screens are largely employed. They work well as to separation and
rapidity, but if the coal is friable the breakage is large. M. Briart rapidity, but if the coal is friable the breakage is large. M. Briart
has adopted another principle, which prevents any breakage, whilst effecting the complete separation of the different classes and largely more gratings placed one above the other, and working in the same way. Each is formed by a row of fixed bars and a row o movable bars, which when at rest lie in the same plane. The
movable bars are fixed in a frame, which at its lower extremity is keyed upon a rotating shaft. The movable bars are abone the fixed bars during one semi-revolution and below it during the
other. During the former they have a longitudinal motion downother. During the former they have a longitudinal motion down-
hill, during the latter a similar motion uphill. Hence when a coal wagon is emptied upon the upper part of the screen, the coal is
first lifted by the movable bars and carried downards ; it then rests on the fixed bars during the lower semi-revolution. At each revolution the coal is thus shaken up throughout its mass and
gradually screened. All the small coal falls through the space gradually screened. All the small coal falls through the spaces
between the bars, whilst the large coal is brought to the bottom without any shock, by a succession on steps. If neecessary, both
sets of bars can be made movable. In the screen of No. 5 shaft beth sets of bars are movable. II It there are to bo three classes of
coal, two screens will be required. The first separates the large coal from the rough slack; the latter, which falls through, is received upon a frame which carries it upwards to the top of the
lower screen, and on this it is separated into rough slack and fine enables the height of the discharging road above the rails of the
delivery road to be lessened. This height has been fixed at 6 metres 19.7 ft . Experiments made on coal screened by the old and the new method have given the following results :

Mechanical screening. Hand soreening
Per cent.
Per cent.

## $\underset{\substack{\text { Larfe coal } \\ \text { Rough slack. } \\ \hline}}{ }$ <br> ${ }_{\text {Fine }}^{\text {Togegether }}$

## Total <br> $\stackrel{31 \cdot 02}{100} 00$

$\square$

\section*{| $\substack{1315 \\ 18108}$ |
| :---: |
| 18 |} In the more recent examples, as in that at No. 5 pit, by simply

turning a handle, without stopping the apparatus, it is possible to
vary the distance between the bars of the screens, so as to alter the vary the distance between the bars of the screens, so as to alter the
character of the screning. There are also mechanical means for cleaning the coal and for transferring the screened coal into wagons
without falling from any the manual labour mych meight. Thime yield is thus increased and
the screening shops, of rectangular build three, are all on the same plan. The three stories. The are large
Iround floor is on the
level of the railway; the first floor contains the serens in to apparatus; and on ; the second floor contains the sprareatens and looding
truce emptying the
trucks. Z he appliances two sides. They consist of turntables or traversers, which bring the serenene coal from under the screen to be cleaned by hand
From these the coal is carried to the railway wagons by special From these the coal is carried to the railway wagons by special
apparatus, referred to below. The trams from the mine are
brought by the endless chain to a set of sidings on the upper floor brought ty the endless chain to a set of sidings on the upper floor
of thie siop. Each siding ends in a tipping cradle or "tumbling
Tom Tom," placed above one of the screens, This consists of two rings fixed together by cross pieces and resting on four pulleys. The
tram enters at one eide and goes out at the other. Whilst pass-
ing it is turned over sideways, and empties its load without shock ing it is turned oover sideways, and empties its load without shock
upon a circular table which spreads the ooal over the full width of by endless chains worked by the main engine to sidings running on each side of the building, by maines engey are returned to the
yard at which they arrived, and so to the mine. The railway wagons which receive the coal stand on the platform of a weighing
machine, so that the weight is known as soon as the wagon is tilled. screening shops is connected by means of the winding engines with a similar system underground, also worked on the endiess chain
principle. This underground chain system has a length of more than 9 kilometres- 5.6 miles-on the whole. Three methods have been used for working the chains. The first consists of a small steam
engine and boiler placed inside the mine. In the second, motion is engine and boiler placed inside the mine. In the second, motion is
transmitted from above ground by an endless rope passing over a pulley at the surfacee, worked by a steam engine, and paing gover a down
the shaft. At the bottom this rope drives, through a second pulley keyed upon the same shaft, the chain of the underground haulage. In the third or automatic system, the trams are brought down to a
level below that at which the coal is got; and the power given by
this descent is used for haulage this descent is used for haulage on the horizontal roads. Inclined
planes are provided down which the full trams run ; and the energy
thus obtained is sufficient. not only to draw up the empty trat
 hauling is really done by the winding engine, which has to raise the coal from a greater depth. All the underground roads are on iron
cross sleepers of the Legrand system
hectolitreses; they are trams contain five
lien entirely of steel, and are supplied with axle boxes on the Keope system. The total power used in the two
ano collieries is not less than 5200 -horse power, produced by 1111 boilers,
and utitised by 78 engines stationary or locomotive. A special
and department, called the Division du Matériel, looks after the whole workmen employed and outside customers. There is a reperial office
for design and experimenting in for design and experimenting, in which all the apparatus, \&\&.., are
designed in full detail, the contractors having nothing beyond the task of construction. The chief matters of interest at the pitits are
as follows:-(1) The ascent and descent of the workmen, which is as fillows:-- The ascent and descent of the workmen, which is
carried on by means of a man-engine or Fahrkunst.t This is worked
by means of a hydraulic balance invented by bI Warochis
 speed of ascent is thus 42 m . $(788$ ist.). prer minute, ser minute that it requires
twenty minutes to ascend or descend through 500 m . As this speed is somewhat slow, a special and improved apparatus has heeen been
erected at No. 5 pit. This improved apparatus , more full y yescribe
. below, was illustrated on page 181 . (2) The winding engines
are all provided with the variable expansion gear of M . Guinotte.
This consists of two valves, This consists of two valves, one on the back of the other, as in the
Meyer system, but the expansion valve is a simple slide fixed to the valve rod. The variation in the expansion is is iven by varying the the
adius and angle at which the excentric is set upon the shaft; and radius and angle at which the excentric is set upon the shatt; and
it is obtained by means of a link-block moving in a link, which is
tuided by two excentrics. The different positions of the link-block guided by two excentrics. The different positions of the link-block
correspond to different degrees of expansion. When this system is correspono to idierent
appied to enines running both ways, the link is worked by a
single exeentric set suitably for either direction, and the second excentric is replaced by a motion regulated dy the valve rod of the
main valve. For winding engines the link-block is worked by a
special gear, which varies the expansion in accordance with the special gear, which varies the expansion in accordance with the
variation of the resistance. In several of thie winding engines the reversal of the valves is effected by means of the special steam gear
called the servo-moteur. (3) The guides within the shaft consist
of $\overline{\text { Vignoles }}$ rails, which of Vignoles rails, which are placed in pairs and fixed to a a series of
girder irons placed one above the other across the centre of the girder irons placed one above the other across the centre of the
shatt This system is found to give much fewer accidents and to
cost much less in maintenance than the old timber guides. The above is only one example of the substitution of iron for wood.
Amongst others smay be mentioned the sleepers on the underground 1oads, the frames for supporting the eroofs, those efor the putleys on
the inclined phanes, and the ventilating doors, all of which are in the inclined planes, and the ventilating doors, all of which are in
iron. Steel ropes, have also replaced the eropes of Manilla fibre
previously in use. In most of the pits the cage is received upon a alanced platform of two stories, the lower of which is already
loaded with return trams. The weight of the cage causes the
platform to descend and brings the cage down to the discharging case of pit No. 5umping engines are not remarkabie, except in instrated on tage 184, and further
illustrations will be found on page 204. (5) The ventilators illustrations will be found on page 20.4. (5) The ventilators,
ten in number, are all on the Guibal system, generally 9 m , in diameter and 2 m . wide ( $29 \cdot 5 \mathrm{ft}$. and 6.6 ft .). Three pits possess two fans, to provide for possible accidents. A special
apparatus, due to M. Briart, and known as the Clapet d' Aerage,
Alows two of the winding pits to be used as upcast shatt allows two of the winding pits to be used as upaast shafts
for the purpose of ventilation. It consists of a strong wooden partition fixed immediately below the reception platform, and of a depth somewhat more than that of the cage. The pit it it thus
divided into two compartments, just large enough to cages. The cages form, as it were, pistons in these two compartments, and whilst they remain therein, the entry of external air nto the shaft is almost entirely cut off. At the receiving platform
there are two traps, or movable covers, which, when the cages are in the shaft, lie over the pit and prevent the entry of air. The traps are raised in guides by the cages when they reach the top, elow the partition is an air drift communicating with the ventilator. By this arrangement it will be seen that the shaft is
always closed either by the caaes or by the traps, so that the
exterio the air from the mine. The closing of the pit is not,
of course, complete, but the air which enters through the holes left for the ropes, \&o., is insignenificant in quantite.
This system has worked well for more than fifteen years. The system has worked well for more than fifteen years, can al ways be supplied. This system is found to offer great advantages over the use of whole timbers. There is a complete railway system worked in common by the two collieries, which conveys the
output to the station at Bascoup-Chapelle. It is worked by five nain line engines and five shunting engines. There is also a whari wharfs, it is conveyed in sheet iron wagons, each consisting of five rectangular boxes placed side by side transversely to the frame.
These boxes can turn on a hinge at one side These boxes can turn on a hinge at one side, and are lifted at the
other side by means of a small steam crane. The side next the hinge opens from the bottom on drawing the bolts, and by tipping a barge. By this arrangement a barge of from sixty to seventy tons can be loaded in less than half-an-hour. For carrying coke and patent fuel, hopper wagons are employed. They are of sheet iron,
nd comprise three hopers square at the bottom, with opening elow the frame. The bottoms are closed by covers which can be the contents from wet. It has a special coupling, which enables them. Whans to be coupled without the workmen passing between
to M. Mabille.

## (To be continued.)

## LOCOMOTIVES IN THE SNOW.

The following amusing sketch is from the pen of Mr Angus Sinclair, in the American Machinist:In the latitude of our northern States, where by far the largest carelessness or mismanagement, to reeeive serious damage from the two extremes of temperature, heat and cold. A case of overheat-
ing is likely to prove destructive and expensive, but such cases are ing is likely to prove destructive and expensive, but such cases are
comparatively rare ; and the probability is that, where severe winperatively prevail, more damage is inflicted upon the equipment of a
road from excess of cold than from excess of code of enginemen deals very sharply with the engineer who burns his boiler, and the action is regarded as the most heinous profes-
sional disgrace. Railroad officers second the sentiment of their engineers in this respect, and they seldom care to trust a man who
has scorched his fire-box and tubes.
effect. Mismanaged excess of cold is treated in a different manner. To 1at an engine freeze up and become helploss scarcely casts a stain upon the reputation of an engineer, although this act may be no
more excusable than the case of burning, and may entail far more erious consequences upon the company
Tertaken by a severe snowstorm on a division that passed over rolling prairie country. The engineer had an excellent engine, equipped with two pumps and one injector, and every way calcu-
lated for successfully weathering any storm likely to be encountered But the man was deficient in natural energy, and within three of a long cutting, without a rod down or a pipe disconnected. By the time the storm abated nothing about the for ward part of the train
was visible, except the top of the smoke stack. Resurrecting this immersed engine caused eight hours' extra delay in clearing the track for traffic. This figured up expensively when the loss o
stock about in this way:-The engineer worked the train along as best he could through the increasing snow drifts, the unusual heavines
of did not think about. When the train stalled in the out where it finally settled down, the engineer cat away and proceeded to work
through the snow. His first indication of the water being low in the tank was the stopping of the pump. Then he attempted to quench the fire before he could melt enough snow to start the
injector. And while the train men were shovelling snow, the engine became so deeply imbedded in the drifts that the engineer
did not see how he could disconnect casy matter-so he succumbed to adverse circumstances. There is no condition of railroad operating where the valuable attainments possessed by a really good engineer stand out so conspicuously as
during the prevalence of distressing winter weather, and no condition so completely annihilates all stamina in the man of scanty
Like every other trying ordeal, the hardships of severely cole or overcome most successfully by thoughtful preparation ahead.
John Steel, one of the most fortunate engineers in the frigid northwest, a man who has wrestled with the snow drifts of twenty-five his uniform good luck to to the practice of never depending on a mild winter, but of having his plans laid out for the worst before a cold
snap comes round. The first consideration in this regard is to have the means arranged conveniently for draining pipes that are exposed to danger from holding water which will freeze ; then
comes the necessity for being able to warm them up with steam. Injectors, as a rule, are more easily preserved from frost than pumps, but most injector branch pipes will freeez up unless they
are supplied with frost cocks. If a pump be carefully antendel frost plugs will go unused for a whole winter, but the engineer wot frost plugs, and that he has the means at hand of pumps have got frost plugs, and that he has the means at hand of taking them
out promptly if necessary. So with other precautionary attach. order.
En
Engineer Tom Myers, of the frigid Northern Railroad, tells with snow siege during the terrible winter of ' 80 . That was Tom's first
srat out on the tight-hand side. One day of the happere to hurricanes of the season overtook him, and its rigoor plainly indi-
cated a block. Presently passenger train No. 62 came alon Tom got orders to leave his own train and double-head 62, and try
to force it through. The engineer of 62 was Uncle John, the
oldest engineer on the road, a man ripe to the experience they were likely to go the road, a man ripe to ne experience they runner. They coupled on and started out, Tom resolving to be
governed by the advice of Uncle John, should he need it. The governed by the advice of Uncle John, should he need it. The
wind kept driving clouds of snow into every sheltered nook, so that their prospects of going far were slender; but the
order to push ahead was imperative, and a hearty trial was needed o show how far they could go. Tom's engine had a low ashpan, the bottom of which reached below the line of the pilot, and it kept raking the snow in front of the back drivers, causing per-
sistent slipping. It was also getting badly frozen from water sistent slipping. It was also getting badly frozen from water
running from a leaky mud ring topped at a point clear of snow and took down the ash-pan they cave considerable relief, and they pushed abead with renewed front was badly drifted, but the trackmen were under the imprestion that the train could go through by making a dash for it.
Both engineers accordingly prepared to do their best, and with coaches behind them they plunged into what proved to and with six mountain at the rate of fifty miles an hour. A great cloud mass of snow rising from the pilot envelopes the engines in complete arkness, a thundering of snow clods on the cab, a tumult of
rattling and slipping of wheels, a hissing and rush of hot steam, feling as if one had jumped from the top of a steeple into a stack This is about the sensation of butting ound that the first engine had gone into spe snowbank almost to the top of the stack, and the avalanche had knocked off the headight and broken in the front cab wincows. The whole train was oon as the impossibility of backing cout bactly driven snow. So were at once taken to make the best of the situation. Uncle ond, who took the lead, set men to work shovelling snow into the has to be resorted to for keeping a water supply, care should be faken to prevent the quantity in the tank from running low.
When the tank is nearly empty a few minutes' shovelling will chil below the melting point.
With the water supply assured, our train men experienced no The heaters were kept going just enoug was fast approaching. working There is far less labound in see that they did not stop stention than there is in thawing them out when they become mass of ice. When an engine remains passive in the snow all the steam needed is what will keep the water and pipes from freezing.
When morning came there was no improvement in the position of he snow-bound train. No change in the weather. To move was lew in as fast as it could be thrown out. All they could do wa to wait for better weather. But waiting meant using up coal, and the supply of that article was limited. Calluulation assured them
that both engines could not be kept alive longer than another iight, so they resolved to let one of them die, so that its coal could ost importance, since it could pull out for supplies as soon as the track could be cleared; so the train engine was cooled down. With much labour and untold suffering, they burrowed in the snow and ook down the main rods, screwed out the cylinder cocks,
removed the frost plugs from the pumps, disconnected the water-boxes, and blew the live steam through the pump boiler and tank. These precautions finished, the engine was as safe from frost as if she was housed in a comfortable round-house. nen. They had just finished the moving of the coal to the liv ostart it without succerss ; then to work. Every effort was made tube found broken. TTe pump was now the only resort. They ff the drivers, poured some oil on the rails, and slipped the wheels suare block to fit the wer. © then the low a channel in a middle of the axle on top of a sorew- jack, and raised up till most of the weight of the wheels was oft the rails. With this rig the
ongine could be pumped as easily as if she had been securely raised
engion The exe
The exemplary persistency of these enginemen was finally re-
warded with success. They held the engine alive till shovellers ame and dug them out. Then they went to the nearest station or fuel and returned for the other engine, which was hauled to a
water tank and there resuscitated. By this means these two ngines were enabled to render material assistance in opening the
road for traffic, instead of helping to encumber the blockade as soud for traftic, instead of helping to encumber the blockade, as
would have been the case had feeble hands permitted them both to col off in the snow.

## $\overline{\underline{0}}$

Acoidents in Enclish Mives.- The annexed table of acciden

| Year. |  |  | $\begin{aligned} & \text { Persons } \\ & \text { employed. } \end{aligned}$ |  |  | Total of mineral mined. |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |
| 1873 | 973 | 1089 | 528 | 481 | 2.079 | 146,887 | 133,677 | ${ }^{393}$ |
| 1874 | 895 | 1056 | 602 | 510 | 1.959 | 157,222 | 133,251 | 4332 |
| 1875 | 927 | 1244 | 578 | 480 | 2:321 | 159,331 | 118,730 | 4501 |
| 1876 | 839 | 933 | 613 | 551 | 1:813 | 177,580 | 159,688 |  |
| 1877 | 864 | 1208 | 572 | 409 | $2 \cdot 443$ | 172,276 | 123,217 | 4231 |
| 1878 | 811 | 1413 | 586 | 336 | $2 \cdot 972$ | 179,777 | 103,183 | 3968 |
| 1879 | 782 | 973 | 610 | 490 | 2.040 | 185,590 | 149,400 | ${ }^{3956}$ |
| 1880 | 815 | 1318 | 595 | 368 | 2.718 | 198,119 | 122,509 | 3904 |
| 1881 | 844 | 954 | 587 | 519 | 1925 | 200,189 | 177,106 | St |
| 1882 | 876 | 1126 | 575 | 447 | 2:234 | 195,586 | 152,161 | 381 |

LTRRME MINULENESS. - When vision is not aided by any
magnifying process, there is a point of minuteness, as all know ot be seen by the unaided eye But when the object is wied y means of a microscope, it becomes visible. There is a question, however, that remains unanswered, which is, whether any object may become so attenuated that it cannot be made visible by any there were lines that could not be resolved by any microscopic difficulty; but, at that time, makers of lenses had not attoined any the skill of making them with large angles of aperture, but now they are made with the highest angle that is possible, and conse greater skill in in theite of manufacture. But the limit of angle of aperture having been reached-no opportunity remaining of in-
creasing capacity in that direction-is it not reasonable to that, with present appliances, no ogreater skill in manufacture can be expected? Sir Royston Pigott, recently, at a meeting of the
Royal Meteorological Society, stated that he had seen globules of mercury, made by smashing a minute particle of mercury with a
watch spring, less than watch spring, less than Ido of robdo of an inch, or less than the
millionth of an inch. Another member replied that he was not than that imposed by the sensibility of the observer's retina, the
correction of the objective, and the illumination. - The Microscope.

## RAILWAY MATTERS.

The consumption of iron rails in France was only 6930 tons in
1882. The total of steel and iron was 290,979 tons. An American contemporary of cars is said to be from 60 c. to 40 c . stopped by another train these prices become somewhat inflated. The line of rail connecting Rhondda with Newport is fast ap-
proaching completion. That also for connecting Oyfarthfa Works with the Great Western and Rhymney system was advancing with the Great Western and Rhymney system was
rapidly, but a hitch has arisen in respect of some land.
AN exchange says that the Cumberland Valley Railroad Company, U.S., which doess a considerable e business in carryying pinconic parties
to points on its line, has devised a new attraction in the form of a to points on its line, has devised a new attraction in the form of a
car rorvided with machinery for supplying eleetric light to such
and parties as may wish to remain
The car is said to be in demand.
ArTER many years, track laying on the great Northern Pacific point some fifty miles west of Helena, Mon. The driving of the golden spike and the formal opening took place on September 8th,
when President Villard, with a large party of guests, assisted in when President Villard, with a large party of guests, assisted in
the historic proceedings which crown the life of the road in its 19th year.
An offer has been made to the Grecian Government by a Belgian company to make a narrow gauge railroad from Nauplis to Pyrgos
for the sum of $25,000 \mathrm{f}$. per kilometre. On the other hand, a group of Austrian capitalists want to make a line from Larissa to Thessalonica, on condition that they obtain the epncession of the line
from Athens to Larissa, at the rate of 150,000 f. per kilometrefand that the Government guarantee 5 per cent. on cost. of engineers, and there is always interest attaching to the estimates that are made of the requirements of rolling sto the by thi-
railways. It is satisfactory to notice that these estimates are railways. It is satisfactory to notice that these estimates are
large, not only beause of the direct effect that the construction of
the stock has on the trades concerned, but also because it is an indication that the traffic managers expect considerable accessions
of traffic. The London and North-Western Railway estimates that in the half year now running its course it would need to
expend $£ 65,081$ on new working stock, as well as a larg ne new steamboats; the North-Eastern places its expenditure at the sum of $£ 00$, ,00; ; the Great Western puts the cost of its require-
ments for the hal-year as $£ 105,000$; the Great Northern ments for the hal-year as $£ 105,000 ;$ the Great Northern at
$£ 50,000$ oontinuous brakes being included -and the Lancashire
and Yorkshire at $£ 72$,000. The Midland Railway and Yorkshire at $£ 72,000$. The Midland Railway and one or two
other lines do not specifically name the amounts, but it is evident that they must be also large; but the sums that have been named There are some probabilities, to, that these estimates may con-
tinue to grow, because the traffic returns of all the great companies have, in the last few months, shown a steady increase
The Philadelphia Record says that "several experienced Western
mechanical engineers visited Philadelphia last week to inspect the mechanical engineers visited Philadelphia last week to inspect the
new locomotive of the Philadelphia and Reading Railroad. One of
these engines new locomotive of the Philadelphia and Reading Railroad. One of
these engines was prominenty brought into ontice by its perform-
ance on the Chicago, Burlington, and Quincy Rairrod during the Chicago Exposition, ard afterwards on the Baltimore and Ohio
Railroad. Particular interest attaches to the Rairoad. Particular interest attaches to the capability of the
locomotive to use ocke for fuel, at that combustible, being entirely free from smoke, will not only at once relieve the Western com-
panies from the penalties for infractions of the laws for the pre-
vention of the smoke nuisance, fut will secure treater comfort and pleasure to the travelling public. The the tests of the the confort and
demomotive coke fuel, without any further attention on the part of thade with
than sumply feeding the furnace, and that meanwhile no clivker other obstruction to the draft occurred during the trials, which were of the most exacting nature. The coke used was the product
of the Connellsville Coke and IIron Company, and its calorific
efficiency was found to be in excess effioiency was found to be in excess of seven pounds of water evapo-
rated for each pound of coke consumed. At the request of visiting rated for each pound of coke consumed. At the request of visiting
experts further evaporative tests of the same kind of fuel are to be
made in one of these locomotives." The Record either never knew, or has forgotten, that for the first twenty-five years of itserexistence,
the locomotive burned nothing but coke. The locomotive boiler the locomotive burned nothing but coke. The locomotive boiler
was specially designed for that fuel, and the Philadelphia engi.
neers are only doing now what was done in Great Britain about neers are only doing now
the time they were born.
AT the instance of the Simplon Railway Company a commission
of experts, composed of Professors Heim, of Zurich; Liory, of Grenoble; Taramelli, of Pavia; and Renevier, of Lausanne, have,
the Times Geneva correspondent says, compiled and published an the Times' ${ }^{\text {' Geneva correspondent says, compiled and published an }}$ interesting memoir on the geologioal condition of the Simplon, with special reference to the probable temperature of the proposed
tunnel. Their general conclusion is that in this respect they would
t. be more favourable than those of the great St. Gothard Tunnel.
The temperature of a tunnel depends chiefly on its length, the
character of the strate the superincumbent mass. In the St. Gothard Tunness of temperature often rose to 30.7 Tdeg . Centigrade - -nearly 90 Fan. F -
in the proposed Mont Blane Tunnel it would probaly be 50 deg. Centigrade- 120 Fah. - in the Simplon Tunnel if the trace projected. in 1877 , which passes through Monte Leone, were adopted, it might
be 48 deg. Centigrade. But it is now proposed to adopt another trace, which, though it would be a curve and make the tunnel
20 kilometres longer than was oontemplated in 1877 , offers, as
compared with the straight line, several import ant advantages. It compared with the straight line, several importent advantages. It
would pass under the valless of the Ganther and the Cheraska,
above which rises the splendid above which rises the splendid amphitheatre of the Diveglia Alp.
The normal temperature of the tunnel on this line would not, it is
computed, exceed 36 dis computed, exceed 36 deg. -95 Fah., -and as the nature, of the
ground wold admit of the sinking of two shafts this temperature
might might be considerably redouced. For this reason, and because the shafts would greatly facilitate, and, therefore, cheapen the work of
construction, the experts are unanimuos in recommending the line construction, the experts are unanimous in recommending the line
by the valles of the Ganther and the Cheraska in preference to
the trace through Monte Leeone AccorDivg to Mr. E. Harford, the general secretary of the
Amalgamated Society of Railway Servants, statistics of the signalmen's hours of duty on the North-Eastern Railway show that out of a total of 994 signal boxes, 886 are worked by persons whose sole
duties are to attend to the siggals. The other 108 are worked by duties are to attend to the signals. The other 108 are worked by
the station staff. Out of the 886 not more than 70 are eight hours,
about 100 are ten hours,
 at a stretch. On the Monmouthshirimed division on dhe the tweat Weesteurs
Railway especially on the Eastern Valley side-most of the Railway-especially on the Eastern Valley side most of the
signalmen are on duty more than twelve hours daily, and in many
instances men "care on fourteen, and in some cases fitten hours, instances men "are on fourteen, and in some cases sifteen hours.
It appears the signalmen referred to have excursion trains to deal
with, and in winter have "lamp duties" to attend to. It is stated
and that on this division of the Great Western system a soignalman who is on duty in his box until eleven p.m. has then to extinguish all
his signal lamps, ococupying over half an hour, and be out again and
light the lamps next To do this the man must be on duty theon after t 4 a.m. Mis Midland
Railway relief signalmen at Wi Railway relief signalmen at Wigston complain that up, to about
twelve montshs agot oeyw were paid a day for eleven hours' day duty and a day for thirteen hours' night duty, the same as the ordinary
twelve hours signalman, but now they have to work Sundey fy nothing. In various other reports instances of long hours worke by railway signalmen have been reported to the general secretary of
the society; and taken together all the statements show that the percentage of eight-hour boxes-the system which would divide the
twenty-four hours between three men over the general railway

Mr. J. A. WANKLYN has called attention to the fact that considerable ammonia is lost in gasworks by the storage of the that the relative rates of evaporation of the volatile ammonia and of gas liquor are 20.1 .
The knot, or nautioal mile, is variously reckoned at from 6076 ft . minute of longitude at the equator, or 6086 ft ., 1.1527 statute inch or 1855 metres, the mean leqgtt of one minute of latitude, osome-
times reckoned as a knot, is 6076 ft ., $1 \cdot 151$ statute mile, or 1852 times reckoned as a knot, is 6076 tit, 1.151 statute
metres. $A$ marine league is three of these sea miles
Dr. ELuss in twelve samples of Toronto soda water found only sence of copper. The so .5 of a grain to the gallon, the average of rine samples being
.2 of a grain. All of the above samples were taken 32 of a grain. All of the above average of nine were taken from feing
tain coisterns, bottled soda water being invariably found free from tain cisterns, bottled soda water being invariably found free from
metallic impurities. How about soda water in England? Scievntric authorities are not at rest with giving Philipp Reiss
the merit of inventing the telephone. The latest claimant the merit of inventing the telephone. The latest claimant put
forth is Charles Bourseul, a Frenchman, who is said to Yortented the telephoune in 1855 . Frenchman, This invention is said to have have
invent
been communiated in 1854 to the French Academy and to appeared in the Didaskalia, a supplementary paper to the Frank-
furter Journal, for September 23th, 1854. M. le Comte du Moncel is advocating the claims of Bourseul.
To encourage tree planting, the last Legislature of New York by the side of the public highway adjoining his premises any forest shade trees, fruit trees, ornamental trees, or any nut-bearing trees, four trees set out. Elms must be placed not less than 7oft. apart trees, ornamental, or fruit trees, nearer than 40ft. apart on the same side of such highway
Among the various substances which have been found on the American, are the following:--Fibres of wool, linen, and cotton fibres of spiral vessels, fibres of muscle, in one case eight hours scales, moths, \&co., hairs from legs of bees, hairs from legs of spiders, pollen of various flowers, stamens of various flowers, hairs cats, quite common; hairs of mouse once only, hairs from tobacco, of chamomile flowers, \&c.
WHEN a collotypic picture is transferred to stone for lithographic ling the first inking matter round the ink becoming pressed out. A recent improve ment by Mr. SWan, however, yields a transfer with a grain
clearly and sharply defined so as to print well from a stone clearly and sharply defined so as to print well from a stone, or
yield a transfer capable of being inked on zinc and other metal. it in water, and as the gelatine softens in parts, the ink is removed by sponging. During this operation the ink breaks up
into a clear grain free from the halo of grease referred to above. The process is not patented.
THE consumption of copper in the United States in 1872 wa
$34,000,000 \mathrm{lb}$, and the gunatity when the consumption was 77,000 ,ont on increasing until last year to import copper, but almost nothing has been done in that direc
tion for several vears. menced in 1880, when it reached $62,000,000 \mathrm{lb}$., as agains 34,
electric lighting business- $-62,000,000 \mathrm{lb}$. in $1880 ; 63,000,000 \mathrm{lb}$. in 35 c . per lb, and taking th 1882 . The average price in 1872 was
 17年c. per 1 b .
THERE were, in round numbers, at the time of the recen enumeration, $24 \frac{1}{2}$ million of inhabitants in Spain and the Spanis
territories. in the Philippine Islands, $1,500,000$ in Cuba, and 750,000 in
in
Porto Rico Porto Rico. There were in Spain itself 5662 communes that had
each less than 1000 inhabitants. The average proportion of each less than 1000 inhabitants. The average proportion of popu-
lation was from 32 to 33 persons to every square kilometre. most thickly-peopled district is the province of Barcelona with 108 Real, which has only 13 inhabitants to the square kilometre. The most populous cities are Madrid, with, in round numbers, 500,000
inhabitants; Barcelona, 249,000 ; Valencia, 143,000 : Seville , 134,000

A NEW firenroofinc liown

A NEW fireproofing liquid-Astrop's patent-is being now intropany, Mildmay-chambers, Bishopsgate, E.C. It is a basic silicate of alumina, and is said to be far preferable to tungstate of soda,
because cyanite does not evaporate or scale oft, while soda because cyanite does not evaporate or scale oft, while soda
requires applying each week. This has been proved, amongst
other places, at the Prinessis has been given up and ccyanite adoppted instead. The Oyanite
Company claim that the use of cyanite is eocomical because it can in most cases, it affirms, secure a reduction in the cost of fir insurance to cyanite users, while cyanite takes the place of and
saves a coat of priming, and lasts for many years when once
applied. We notice that cyanite "soaks into the wood, and is not therefore liable to be chipped or knocked off."
The most recent report of the Department of the Interior states egal supervision, 1472 of these water furnishes the movement to the amount of 41,316 -horse 117. The number of operatives employed is 134,862 , of which
10 , 70,364 are males and 64,498 females. There are 10,462 children
betwwen 14 and 16 years of age, 14,590 between 16 and 18 , 109, and 109,810 over the latter age. The textiles, such as cotton, silk,
wollen and linen, occupy 1619 factories, with 85,705 work people, 68 establishments carry on tanning, , leather dressing, hair
weavi; 6 , 143 food preparing shops ; 2749 in 102 chemieal works $; 4950$ in 150
150 printing shops. There are also 111 wood working establishments
occupying 2913 hands ; 353 for clock and jewellery making, with Ir is stated that a new electrical contrivance has been perfected his name. This ieorve, the inventor of the telephone which bears carried on through says, enable every description of conversation reproduced at any future time. Briefly stated, Mr. Mr. St. George'
invention may be thus described. nvention may be thus described : A circular plate of glass is ooated
with collodion and made sensitive as a photographic plate. This is placed in a darr box in which is a slit to admit a ray of light. In
front of the glass is a opens and closes a small shutter through which a beam of light is constantly passing and imprinting a dark line on the glass.
Vibrations of the sututer cause the dark line to vary in thickness according to the tones of the voice. The glass plate is revolved by
clockwork, and the conversation as it fiecorded on the sensitive plate, the imprinted words spoken bein after wards, and when replaced in the machine and connected with
a distant telephone will, when set in motion, give back the original

MISCELLANEA.
MnssRs. Joskph EvaNs AND Soss, of Wolverhampton, have been awarde
Exhibition.
The whole of the machinery at the West Hartlepool Wagon
Works, which bas been idle for several years, is about to be offered for sale by auction.
THE port of Vladivostock has just received a new iron dock from England, and the naval men cherish the hope that their ships MessRs. Negretti AND ZAMBRA, of Holborn Viaduct, have
eeen recently appointed sole agents for the United Kingdom and been recently appointed sole agents for the United Kingdom and
the Colonies for the patent liquid tompasses of Messrs. Ritchie and
Sons, of Boston, US.A.A. M. ALEXANDRE Pourceri, the eminent metallurgist, who has
contributed so much towards making Terre Noire one of the most contributed so much towards making Terre Noire one of the most
famous steelworks of Europe, has resigned, and has accepted the charge
Spain.
THE celebrated engineer, Mr. George Remington, after a linger-Ashchurch-grove, Shepherd's-bush. Sept. He had lived with his family ally engaged, and during his deelining years had become totally bind.
AT a meeting of the Newcastle City Council on the 5th inst., the committee be appointed to confer with the River Tyne Commissioners for the purpose of ascertaining the feasibility or otherwise
of constructing a ship canal, connecting Newoastle and district he Solway Firth.
THE Electric lighting Committee of the Leeds Corporation tenders for carrying out the scheme of lighting part of the borough
with electricity care, and will authorities. The work will not be fnished this year. The ABout eight years ago a small steamer named the Harbinger, of
London, struck on a wreck off Dover, and went down with a valuable cargo of block tin. Attempts have been made from time to time to recover the cargo, but without success. The plan, however,
has been tried of making holes in the vessel to allow the upper portion of the cargo to wash away, leaving the tin exposed. This the metal daily.
THE disposal of town's refuse by sending it in a spécial sewage steamer eight or nine miles of sea and then dropping it into not Corporation of Liverpool. Messrs. W. Simons and Co , of Renfrew, have just constructed a second steamer to carry 800 tons of in use for so is, twice the size of the first one, which has now been same method has been practised at New York for several years. So dissatisfied are works' proprietors at Willenhall, near Wol-
verhampton, with the high rate which they have to pay for their versampton, with the the Monmoor-lane Iron Company has begun manufacburing on its own account, and its example is to be followed by more than other towns in the Black Country. Meanwhile the local authorities are gathering all the information they can upon
the subject, with a view to purchasing the works of the gas company.
Owivg to the scarcity of orders for new vessels, it is expected
that Messrs. Raylton, Dixon, and Co., of Middlesbrough will to reduce the number of workmen employed at their yard. The unless fresh contracts are entered into within the commenced, and bout 1000 men will be thrown out of hir the next two months, sent time Messrs. Dixon employ about 2700 men, and pay $£ 4000$
per week in wages. They have not received an per week in wages. Th
vessel since March last.
THE question of providing a thorough system of drainage for he river Tame, has this week come before Mr. S. J. Smith, C.E. Local Government Board Inspector. The authorities of both towns
have as yet not determined upon the best scheme to adopt, and
asked for time to consider. The inspecto should expect a scheme for Darlaston within six weeks or two months, and when the Wednesbury authorities demanded the
limit of six months accorded by the Rivers Pollution Act, he pressed for a shorter period.
A SPECIAL sub-committee of the promoters of the Manchester others as to the plan to be adopted in the Bill to be introduced into Parliament next session. Several alternative schemes and cussed, and it was decided to adhere to the original scheme in its main features. Various alterations were, however, resolved upon, of it was believed by the committee that they would have the effect same time remove much of the opposition which had to be encoun-
tered during the last tession ,
A Joint committee of the Corporations of Neweastle and Gatessame elevation trom the river as the present " high level" "namely,
about $90 f t$. Its cost is estimated at $£ 200,000$, of which two-thirds would have to be borne by Newcastle, and one-third by Gateshead. question will be definitely dealt with at a future meeting. It is also proposed to construct a ship canal from the Tyne at Newcastle
to the Solway Firth. At the last meeting of the Town Council a motion in favour of the appointment of a committee to ascertain

THE quarterly meeting of the members of the Manchester Asso Saturaay, when five new members were admitted. The president Mr. Thomas Ashbury, O.E., alluding to the approaching winter and subjects to be discussed was not yet complete, he might refer Tharine following promises:-"The Forging and Finishing of
 Mr. T. Baldwin, late chief engineer to the Mutesian Well Boiler Insurance
Company, Manchester ; "Electricity," by Mr Wo Company, Manchester; "Electricity," by Mr. Warburton, elec-
trician to the Lancashire and Yorkshire Railway Company; and
"Fuel Economisers," by Mr. T. L. Daltry, Manchester. Tuel coonomisers, by Mr. 1. L. Daltry, Manchester.
AT a cost of between $£ 3000$ and $£ 4000$ the South Staffordshire Bilston and Tipton district, a large pumping engine capable of draining an area of between four and five square miles of mines now water-
locked. It is a Cornish beam engine with a 7 fin. cylinder, 8 ft . 6 in. locked. It is a Cornish beam engine with a 7 6in. cylinder, 8 ft. Gin.
stroke. The pumps consist of two bucket
bott The buckets to the top, and having brass lined working barrels action of the water. The buckets and their clacks are of the
hatband type. At each stroke of the pumps 221 gallons of water are delivered, and they will be able to raise ewo and a-half
million gallons per day, or over 25 per cent. morewater than the
two Stow Heath engines used to pump. Preparations for start-ing the engine began in Apriil, and since then it has been thoroughly and the engine has been fitted with Davey's patent differential
valve gear.

PUMPING ENGINE, BASCOUP COLLIERIES.

E, MARIEMONT COLLIERIES.


THE NEW PATENT ACT.

## Pat $\mathrm{V} *$ - Geage 1

Patent-office and procedings thereat.- 82 . (1) The Treasury may
rovide for the purposes of this Act an office with all reauisite provide for the purposes of this Act an office with all requisite
buildings and conveniences, which shall be called, and is in this Act referred to as os, the Patent-0.fice. shal Until a anew and Patent-office is
provided, the offices of the Commisioners of Patents for inventions provided, the officess of the Commissioners of Patents for inventions
and for the registration of designs and trade-marks existing at the and for the registration of designs and trade-marks existing at the
commencement of this Act shall be the Patent.oftiee within the
meaning of this meaning of this Aot. (3) The Patent-office shall be under the
immediate control of an officer called the Comptroller-General of Patents, Denigns, and Trade-marks, who shall act under the super-
intendence and direction of the Baard of Trade. (4) Any act intendence and direction of the Board of Trade. (4) Any act or
thing directed to be done by or to the Comptroller may, in his absence, be done be bo to any ofticer for
behalf authorised by the Board of Trade.
83. (1) The Board of Trade may at any time after the passing of
this. Act, and from time to time subject to the this Act, and from time to time, subject to the approval of of the
Treasury, appoint the Comptroller-General of patents, designs, and Treasury, appoint the Comptroller-General of patents, designs, and
trade-marks, and so many examiners and other officers and clerks,
with and may from time to time remove any of thoard of Trade think fit, (2) TThe salaries of those officeres and olerks shall beapspainted by
the Board of Trade, with the concurrence of the Treasury, and the the Board of Trade, with the concurrence of the Treasury, and the
same and the other expenses of the execution of this Act shall be same and
paid out of money provideseby Parliament.
84 There shall
thereof shall be judicially noticed and admitted in and impressions 85. There shall not be entered in any register kept under this
Act, or be reeeivable by the Comptroller, any notice of any trust Act, or be receivable by the Com
expressed implied or constructive.
tion. The Comptroiler may refuse to grant a patent for an invention, or to register a design or trade-mark, of
in his opinion, be contrary to law or morality.
87. Where a person becomes entitled by assi
or other operation of law to entitled patent, assignment, transmission,
registered de the cosign, or to a repyright in a registered design, or to a registered trade-mark, the Comptroller
shall on request, and on proof of title to his satisfaction, cause the
name of such person to be entered copyright in the design, or trade-mark, in the register of patents, designs, or trade-marks, as the case may be. The person for the
time keing entered in the register of patents, designs, or trade-
marks, as proprietor of marks, as proprietor of a patent, copyright in a design or trade-
mark as the case may be, shall, subject to any rights appearing
from such register to from such register to be vested in any other person, have power
absolutely to assign, grant licenses as to, or otherwise deal with.
the the same and to give effectual receipts for any consideration for
such assignment, license, or dealing. Provided that any equities likect of such patent, design, or trade-mark may be enforced in 88 manner as in respect of any other personal property.
times be oepen to tor kept under this Act shall at all con che
times be open to the inspection of the public, subject to such regu-
lations as may be prescribed; and certified copies, sealed with thlations as may be prescribed; and certified copies, sealed with the
seal of the Patent--ffice, of any entry in any such register shall be given to any person requiring the same on payment of the pre-
89. Printed or written copies or extracts, purporting to be eertified
by the Comptroller and sealed with the seal of the Patent-office, in the Patentents, specifications, disclaimers, and other documents in the Patent-offite, and of or from registers and other books kept dominions, and in all proceedings, without further proof or pro duction of, the originals.
90. (1) The court
agriieved by the oumission mithout sufficient cause of any person any person from any register kept under this Act, or by any entry for making, expunging, or varying the entry, as the court think fit; or the court may refuse the application; and in either case
may make such order with respect to the costs of the proceedings as the court thinks fit. (2) The court may in any proceeding under this section decide any question that it may be necessary or
expedient to decide for the rectification of a register, and may direct an issue to be tried for the decision of any question of fact and may award damages to the party aggrieved. (3) Any order of
the court rectifying a register shall direct that due notice of the 91 Thion be given to the Comptrolle
the prescribed fee,-(a) Correct any clerical error in or in in ied by tion with an application forrace patent, or for registration of a design or trade-mark or (b) correct any olericial error in the thame, style,
or address af the registered proprietor of a patent, design, or tradeor address af the registered proprietor of a patent, design, or trade-
mark. (c) Cancel the entry or partof the entry of a trade-mark on
the repister, provided that astatutory declaration made by himselff statating his his request by and calling, and that he is the person whose name appears on the register as the proprietor of the said trade-mark.
apply to the eourt for froprietor of any registered trade-mark may an essential particular within the meaning of it may think fit. (2) Notice of any intended application to the court under this section shall be given to the Comptroller by the
applicant; and the Comptroller shall be entitled to be heard on the onp proof thereof and on cayment of the prescribed Comptroller shall, on proof thereof and on payment of the prescribed fee, cause the
register to be altered in confornity with the order of eave.
93. If any person makes or cuases any register kept under this Act, or a writing falsely purporting to be a copy of an entry in any such register, or produces or tenders, knowing the entry or writing to be false, he shall be guilty of a 94. Where any discretionary power is by this Act given to the
Comptroller, he shall not exercise that power adversely to the Comptroller, he shall not exercise that power adversely to the
applicant for a patent, or for amendment of a specification, or for within the prescribed time within the preseribed time by the applicant-giving the
an opportunity of being heard personally or by his a gent.
95. The Comptroller may, in any arising in the administration of any of the provisions of this Act, apply to either of the law officers for directions in the matter.
96. A certififate purporting to be under the hand of the Comptroller as to any entry, matter, or thing which he is authorised by this Act, or any general rules made thereunder, to make or do, shali
be prima facie evidence of the entry having been made and of the cont $n$ ss thereof, and of the matter or thing having been done or left undone.
97.
(1) An required to be left, made, or apicen other document authorised or by a prepaid letter throught person under this Act, may be sent
deem ; and if so sent shall be deemed to have been left, made, or given respectively at the time
when the letter containing the same would be delivered in the ordinary course of post. (2) In providing such service or sending,
it should be sufficient to prove that the letter was properly addressed and put into the post. 98. Whenever the last day fixed by this Act, or by any rule for the time being in force, for leaving any document or paying any or on a Saturday or Sunday, or any day observed as a holiday at
the Bank of England, or any day observed as a day of public fast or thankggiving, herein referred to as excluded days, it shall be
lawful to leave such document or to pay such fee on the day next following suche excluded day, or days if two or more of them occur
consecutively. Part
99. If any person is, by reason of infancy, lunacy, or other
inability, incapable of making any declaration or doing anything required or permitted by this Act or by any rules made under the
authority of this Act, then the authority of this Act, then the guardian or committee (if any) of
such incapable person, or if there be none such incapabie person, or if there be none, any person appointed
by any court or judge possessing jurisdiction, in respect of the pro-
perty of incapable persons, perty of incapable persons, upon the petition of any person on
behalf of such incapable person, or of any other person interested
in in the making such declaration or doing such thing, may make as circumstances permit, and do such thing in the name and on behalf of such incermathe person, and all acts do tone name and sund sub-
bstitute shall for the purposes of this Act be as effectual as if done by the person for whom he is substituted.
100. Copies of all specifications, drawings, and amendments left for and sealed with the seal of the erement of thitent-oftice, shall bee printed trans-
mitted to the Edinhurgh mitted to the EEinburgh Museum of Sceient-oftice, and Ahall be trans- to the
Enrolments-office of the Chancery Division in Ireland, and to the Rolls-office in the Isle of Man, within twenty-one days after the same shalicespectively Patent-office ; and certifed copies of or exted or allowed at the documents shall be given to any person requiring the same payment of the prescribel fee; and any such copy or extract shall be admitted in evidence in all, courts in s.ontland and Ireland and
in the Isle of Man without further proof or production of the originals. 101. (1) The Board of Trade may from time to time make such to the provisions of this Act:- (a) For regulating the practice of
registration under this Act. (b) For classifying registration under this Act. - (b) For cegassifying goods for the
purposes of designs and trade-marks. (c) For making or requiring purposes of designs and trade-marks. (c) For making or requiring
duplieates of specifications, amendments, drawings, and othe selling of copies For securing and regulating the publishing and Trade think fit, of specifications, drawings, amendments and other docuuments. (ed For securing and regulating the making, printing,
publishing and selling indexes to, and abridgments of, specifica-
tions and other do her documents in the Patent-office; and providing fo ( $f$ ) For regulating (with the approval of the Treasury) the pre sentation of copies of Patent-oficice publications to patentees and
to public authorities, bodies, and institutions at to public authorities, bodies, and institutions at home and d abroad.
(g) Generally for regulating the business of the Patent-offie, and (g) Generally for regulating the business of the Patent-office, and
all things by this Act placed under the direction or control of the Comptroller or of the Board of Trade. (2) Any of the forms in made by the Board as act may be altered or amended by rule under this section at any time after the passing of this Act, but
not $s$ on as to take effect bet not so as to take efiect before the commencement of this Act, and
shall (subject as hereinafter mentioned) be of the same effect as it
then they were contained in this Act and shall be judicially noticed (4) Any rules made in pursuance of this section shall be laid before of making thereof, or, if not, then as soon as prasticable after the beginning of the then next session of Parliament, and they shall
also be advertised twice in the official journal to be issued by the
Comptroller Comptroller. (5) If either House of Parliament, within the next orty days after any rules have been so laid before such House resolve that such rules or any of them ought to be annulled, the prejudice to the validity of anything done in the meantime unde 102. The Comptroller shall, before the first day every year, cause a report respecting the execution by of under hin
of this Act to be laid before both Houses of Parligment, hall include or the year to which each report relates and therein rules made in that year under or for the purposes of this Act, and received and paid under this Act.
International and Colonial arrangements.-103. (1) If he
Majesty is pleased to make any $r$ Governments of any foreign Stante or S test with the Government any person who has agns, and trade-marks, or any of them, then any person who has applied for protection for any invention,
design, or trade-mark in any such State, shall be entitled to a nark, as the case may be, under this Act, in priority to othe applicants; and such patent or registration shall have the shme ate as the date of the protection obtained in such foreign State. within seven months, and in the case of a design or trade-mark within four months, from his applying for protection in the foreign State with which the arrangement is in force. Provided that rietor of the design or trade-mark to recover damages for infringe-
priet ments happening prior to the date of the actual acceptance of his complete specification, or the actual registration of his design or trade-mark in this country, as the case may be. (2) The publiaa
tion in the United Kingdom, or the Isle of Man during the respec ive periods aforesaid of any description of the invention, or the
use therein during such periods of the invention, or the exhibition ase therein during such periods of the invention, or the exhibition
or use therein during such periods of the design, or the publication therein during such periods of a description or representation of the design, or the e uese therein during such periods of the trade mark, shall not invalidate the patent which may be granted for the
invention, or the registration of the design or trade-mark. (3) The inder application for the tegrant of a patent, or the registration of a be made in the same manner as an ordinary application unden must Act: Provided that, in the case of trade-marks, any trade-marl, he registration of which has been duly applied for in the country
of origin may be registered under this Act: (4) The provisions origin may be registered under this Act: (4) The provisions of
this section shall apply only in the case of those foreign States with respect to which her Majesty shall from time to time by Order in Council declare them to be applicable, and so long only in
the case of each State as the Order in Council shall continue in orce with respect to that State.
104. (1) Where it is made to appear to her Majesty that the Legislature of any British possession has made satisfactory pro-
vision for the protection of inventions, designs, and trade-marks, patented or registered in this country, it shall be lawful for her
Majesty from time to time by Order Majesty from time to time, by Order in Council, to apply the provisions of the last preceding section, with such variations or addi-
tions, if any, as to her Majesty in Council may seem fit to such tions, if any, as to her Majesty in Council may seem fit, to such
British possession. (2) An Order in Council under this Act shall and
from a date to be mentioned for the purpose in in the Order, take effect as if its provisions had been contained in the Order, take
shall be lawful for ther ; but it shall be lawful for her Majesty in Council to revoke any Order in
Souncil made under this Act. Offencess.-105. (1) Any person who represents that any article
sold by him is a patented article, when no patent has been granted for the same, or describes any design or trade-mark applied to any every offence on summary conviction to a fine not exceeding five
pounds. (2) A person shall be deemed, for the puposes of the enactment, to represent that an article e , for the purposes of this trade-mark is registered, if he sells the article with the word
"patent," "patented," "، registered," or any word or words expressing or implyingted," "registered," or any word or words ex-
por patent or registration has been obtained
for the article stamped, applied to, the article.
106. Any person who, without the authority of her Majesty, or
any of the Royal Family, or of any Government Department any of the Royal Family, or of any Government Department,
assumes or uses in connection with any trade, business, calling, or profession, the Royal arms, or arms so nearly resembling the same
as to be calculated to deceive, in such a manner as to lead other persons to believe that he is carrying on his trade,
business, calling, or profession by or under such authority as ofore
said, shall be liable on summary conviction to a fine not exceeding Scolland, , Ireland, do. - 107 . In any action for infringement of
patent in Sootland the provisions of this Act, with respect to a patent in Scotland the provisions of this Act, with respect to
calling in the aid of an assessor, shall apply, and the action shall be tried without a jury, unless the court shall otherwise direct process of the courts in Scotland in such an action in forms o or proceeding respecting a patent hitherto competent to those
courts. For the purposes of this section, "Court of Appeal" shall mean any court to which such action is appealed.
108. In Scotland any ofience under thile
punishable on summary conviction may be prosecuted in the sheriff
109. (1) Proceedings in Scotland for revocation of a patent shall
be in the form of an action of reduction at the instance of the Lord be in the form of an action of reduction at the instance of the Lord
Advocate, or at the instance of a party having interest with his only. (2) Service of all writs and summonses in that action shall be made according to the forms and practice existing at the com110. All partis Act.
110. All parties shall, notwithstanding anything in this Act,
have in Ireland their remedies under or in respect of a patent as if
the sime 111. (1) The provisions of this Act conferring a special jurisdiction on the court as defined by this sctunceshalng not, exceept so far as
the jurisdiction extends, affect the jurisdiction of any Scotland or Ireland in any proceedings relating to patents, or to
designs, or to trade-marks and with ref designs, or to trade-marks, and with reference to any such pro-
ceedings in Scotland, the term "the Court" shall mean any Lord
Ordinary of the Ordingry of the Court of Session, and the tert " shall "Court of any Lord Appeal "
Ohall mean either Division of the said Court " shall mean either Division of the said Court; and wourthreferencee to
any such proceedings in Ireland, the terms "the Court" and "the Court of Appeal" respectively mean the High Court of Justice in rectind and her Majesty's Court of Appeal in Ireland. (2) If any
rection of a register under this Act is required in pursuance of any proceeding in a court in Scotland or Ireland, a a copy of the
order, decree, or other authority for thent served on the Comptroller, and he shall rectify the register
accordingly.
112 This Act shall extend to the Isle of Man, and (1) Nothing Nan, in proceedings for infringement, or in any action or proceed ing respecting a patent, design, or trade--mark competent to to those
courts. (2) The punishment for a misdemeanour under this Act in the Isle of Man shall be imprisonment for any term not exceedin not exceeding one hundred pounds, at the with or without a fin (3) Any offence under this Act committed in the Isle of Man whio would in England be punishable on summary conviction may be
prosecuted, and any fine in respect thereof recovered at the instanc of any person aggrieved, in the manner in which offence
punishable on summary conviction may for the

Repeal; transitional provisions; savings - 113 described in the Third Schedule to this Act are hereby repealed. of any of those enactments, or any patent or copyright or right to ppointment made, or compensation granted, or order or direction made or given, or right, privilege, obligation, or or liailitity arquired,
accuued, or incurred, or anything duly done or suffered under or by any of those enactments before or at the commencement of this Act; or (b) interfere with the institution or prosecution of an such proceecing may be orried on as in respisect Aterereof, had not been
passed; or $(c)$ take away or bbridge any protection or neneft in relation to any such action or proceeding.
114 (1) The registers of patents and of
narts of thent repealed by this Act shall respectively be deemed parts of the same book as the register of patents kept under this
Act. (2) The registers of designs any enactment repealed by this sct shall respectively be deemed parts of the same book as the register of designs and the register 115. All general rules made by
other authority under any enacetment repealed by this Act, and in
oree at the commencement of thi orce at the commencement of this Act, may at any time after the
passing of this Act be repealed, altered, or amended by the Board Trade, as if they had been made by the Board under this Act affect before the commencement of this or amendment shall take said, such general rules shall, so far as they are consistent with and are not superseded by this Act, continue in force as if they had 116. Noth the in this Act shall ter this Act.
dicialy affect the prerogative of the Crown in relation to the
cranting of any leter thereof. Act, unless the context otherwise requires-" "Person"" includes Aot, uness rhe context otherwise requires- "Person" includes a
boy corporate " "The Court" means subject to the provisions sor
Scotland, Ireland, and the Isle of Man) hey Majesty 's High Court Attustice in England; "Law Officer" means her Majesty's sury" means the Com Coicior-General for England; "The Trea- of her Majesty's Treasury;
"Comptroller " means the Comptroller-General of Patents, Designs, and Trade Marks, "Prescribed" means prescribed by within the meaning of this sct ; ; "British possession"" means any territory or place situate within her Majesty's dominions, and not
being or forming part of the United Kingdom, or of the Channel
Ind one legislature, as hereinafter defined, are deemed to be one
Rritish includes any person or persons who exercise legist; "Legislature" the British possession ; and where there are local legislatures as well as a central legislature, means the eentral legislature only; In the
application of this Act to Ireland, "Summary conviction" means and conviotion under the Summany, Jurisdiction Acts, that is to to say,
with reference to the Dublin Metropolitan Police Districts the regulating the duties of justices of the peace and of the police for
such district, and elsewhere in Ireland the Petty Sessions (Ireland) Act, 1851, and any Act amending it.

SCHEDULES
£tal
Stamp. THE FIRST SCHEDLLE.-FORMS OF APPLIForm A.- Form of Application for Patent.
I, John Smith, of 29 , Perry-street, Birmingham, in the county
Warwick, engineer, do solemnly and sincerely declare that I am of Warwick, engineer, do solemnly and sincerely declare that I am
in possession of an invention for "Improvements in Sewing that the same is not in use by any other person or persons to the the
best of my knowledge and belief; and I lumbly pray that a patent best of my knowledge and byilief; and I Inumbly pray that a patent may be granted to me for the said invention.
And $I$ make the above solemn declaration ing the same to be true, and by viclaration conscientiously beliiev
Statutory Declarations Act, 1835,

Declared at Birmingham, in the county of Warwick, this day of 18 . Sefore the Mrs ADAMS,
Justice of the Peace.



Form B.-Form of Provisional Spectifioation
Improvements in Sewing Machines,
I, John Smith, of 29 , Perry-street, Birmingham, in the oounty of Warwick, engineer, do hereby declare the nature of my inven-
tion for "Improvements in Sewing Machines," to be as follows :-

Dated this day of 18

John Smith.

Note.-No stamp is required on on this document | $£ 3$ | Form C.-Form of Complete Spectification. |
| :---: | :--- |

I, John Smith, of 29 , Perry-street, Birmingham, in the county of Warwick, engineer, do hereby declare the nature of my invention for " Improvements in Sewing Machines," and in what manner the
same is to be performed, to be particularly desoribed and ascertained in and by the following statement:-

Having now particularly described and ascertained the nature deolare that what I claim is 1.
2.
3. \&

Dated this day of 18 . John Smith.
Form D.-Form of Patent.
VICTORIA, by the grace of God, of the United Kingdom of Great Britain and Ireland, Queen, Defeering to whom these presents shal come greeting: Birmingham, in the county of Warwick, engineer, hath by his solemn deciaration "Improvements in Sewing Machines," that he is the true and first inventor thereof, and that the same is not in use by any other person to the best of his knowledge and belief.
And whereas the said inventur hath humbly prayed that we
would be graciously pleased to grant unto him-hereinafter together would his exacutors, administrators, and assigns, or any of them, referred to as the said patentee-our Royal Letters Patent for the sole use and advantage of his said invention:
And whereas the said inventor hath by and in his complete
specification particularly described the nature of his invention: specification particularly described the nature of his invention:
And whereas we being willing to encourage all inventions which may be for the public good, are graciously pleased to condescend to his request
Know ye, therefore, that We, of our especial grace, certain know-
ledge, and mere motion do by these presents, for us, our heirs and ledge, and mere motion do by these presents, for us, our heirs and successors, give and grant unto the said patentee our especial
license, full power, sole privilege, and authority, that the said patentee by himself, his agents, or licensees, and no others, may at all times hereafter during the term of years herein mentioned, make, use, exercise, and vend the said invention within our inited Kingdom of Great Britain and Ireland, and Isle of Man, in such
manner as to him or them may seem meet, and that the said manner as to him or them may seem thele profit and advantage from time to time accruing by reason of the said invention, during the term of fourteen years from the date hereunder written of these presents : And to the end that the said patentee may have and enjoy the sole use and exercise and or us our heirs and successors trictly command all our subjects whatsoever within our United Kingdom of Great Britain and Ireland, and the Isle of Man, that they do not at any time during the continuance of the said term
of fourteen years either directly or indirectly make use of or put of fourteen years either directly or indirectly make use of or pu
in practice the said invention, or any part of the same, nor in any in practice the said invention, or any part of the same, nor in any wise imitate the same, nor make or cause to be made any addi
ion thereto or subtraction therefrom, whereby to pretend them selves the inventors thereof, without the consent, license, or agreement of the said patentee in writing under his hand and seal, on pain of incurring such penalties as may be justly inflicted on
such offenders for their contempt of this our royal command, and uch offenders for their contempt of this our royal command, an amages are on this condition: Provided that these our letters erm it be man condition, that, if at any time during the said ix or more of our Privy Council, that heirs, or successors, or any to law, or prejudicial or inconvenient to our subjects in general, or use and exercise thereof within our United Kingdom of Great use and exercise thereof within our United Kingdom of Great
Britain and Ireland, and Isle of Man, or that the said patentee is not the first and true inventor thereof within this realm as aforesaid, these our letters patent shall forthwith determine, and be void to all intents and purposes, notwithstanding anything hereinbetore contained: Provided also, that if the said patentee of the grant of these. letters patent, or in respect of any matter
relating thereto at the time or times, and in manner for the time relating thereto at the time or times, and in manner for the time
being by law provided; and also if the said patentee shall not being by law provided; and also if the said patentee shall not
supply or cause to be supplied, for our service all such articles supply or cause to be supplied, for our service all such officers or
of the said invention as may be required by the commissioners administering any department of our service in
such manner, at such times, and at and upon such reasonable prices and terms as shall be settled in manner for the time being by law
provided, then, and in any of the said cases, these our letters provided, then, and in any of the said cases, these our letters shall determine and become void notwithstanding anything hereinbefore contained: Provided also that nothing herein contained shall prevent the granting of licenses in such manner and for sueh considerations as they may by law be granted : And lastly, we do
by these presents for us, our heirs and successors, grant unto the by these presents for us, our heirs and successors, grant unto the
said patentee that these our letters patent shall be construed in the said patentee that these our letters patents
most beneficial sense for the advantage of the said patentee. In witness whereof we have caused these our letters to be made patent this
and to be seal
hundred and
(Seal of Patent-office).

## THE SECOND SCHEDULE

## Fers on Instruments for Obtaining Patents and Renewals.

## On application for provicional p

On filing complete specification with first application
On certificate of renewal (b.) Further before four years from date of patent.
(c.) Further before end of seven years, or in the case of patenis granted after the commucemen
eight years from date of patent.
Or in lieu of the fees of $£ 50$ and $£ 100$ the following annual Before the :forethe expiration of the fifth
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## LETTERS TO THE EDITOR.

## [We do not hold ourselves responsible correspondents.]

## THE STABILITY of sHips.

Sir,-In answer to Sir E. J. Reed's letter in your last number, I beg to say that in my former letter to you on the launching of the
Daphne I meant to imply that the effect of the engines on the Dhwartship position of her centre of gravity had probably been
then general interest. The reason now given in your paper, that "as a matter of fact the engines were nearly evenly balanced," has been many notices in the daily and professional papers, and one in the many notioes in the daily and professional paperses and be in extenso. Now as the great majority of merchant steamers have engines that are by no means evenly balanoed, but have their condensers
oonsiderably to the port side of the centre, and their pumps beyond oonsiderably to the port side of the centre, and their pumps beyond
that, with large valves and pipes acting with a leverage of nearly that, with large valves and pipeas of the ship, and the bed-plates and engine framing all much heavier on the same side, the fact that the Daphne's engines were nearly balanced shows that they were of an exceptional type, and is of suffficient importance to deserve the same publicity as the rest of the report.
Printing-court-buildings, Newcastle-on-Tyne,
September 11th.

SIR,-The comment of Sir E. J. Reed on the letter and diagram illustrative of the stability of vessels under the condition of launching is perfectly intelligible. My intention in submitting tat the subject to your more general readers, and to those who may not be so thoroughly conversant with the subject.
May I be permitted to supplement the views therein stated by very slight deviation from the ordinary proportions in a ship, a state of instability may be brought about. But the diagrams are not only illustrative of the stability under the condition of launching, bu and the relative value of any form of section and proportion of the vessel.
By the construction of these diagrams it is possible to foresee the relative values of any two or more forms or sections as producing tability, and the value of breadth ont crease of this most important element.
by comparison or the former diagram will indicate at once be seen that stability under any condition of loading, the present diagram wil show a decrease in stability that may endanger the safety of stability in a sea way; and I am of opinion that if the diagrams

were drawn for the relative proportions and values of the vessels, before the commencement of design or construction of the vessel, both owners and builders would be induced to weigh the relative
merits of the sections and proportions. For as much weight merits of the sections and proportions the other and even more by the broader vessel on the same draft; and the cost of construction could not be considerably in excess of the narrower and deeper vessel.
At the same time, whilst the whole question of the stability of ships is undergoing consideration, would it nut be as well to con sider also the stability of the ship under the condition of any one
or more of the holds becoming filled with water? For is it not possible that upon a vessel receiving injury, and any one or some
of her holds becoming filled with water, the stability lost through of hor holds becoming filled with water, the stability lost through
the destruction of the parts may reduce the stability and bring about a state of capsize? The arguments in your article on the serious consideration.
Charlton, September 8th.

## the definition of force.

Sir, - The letter of "A Student" in your last impression furnishes an instance of the results of the existing system of teaching
science. Here we have a young man who quotes names glibly science. Here we have a young man who quotes names glibly
enough to gain him credit for erudition, who is not anxious to know what force is in itself, but who is very desirous of knowing what sense he is to attach to the word when he meets with it. One would have thought that for the mere word he would have cared little, for a correct knowledge of the thing a great deal.
I have no quarrel with Newton's den, the ford the word force is to be used, namely, that it is "anything which
causesmotion." That definition is wide enough for me, butitmay cause confusion in the minds of others, and it has evidently created a great deal of perplexity in the mind of "A Student." When your correspondent has studied a little more, he will learn that very
able men indeed hold that there is no cause of motion distinct able men indeed hold that there is no cause of motion distinct
from motion, that, in one sentence, motion is the cause of motion. from motion, that, in one sentence, motiond is a noun, and Newton has said that force is anything that causes motion; but motion causes motion, therefore force is motion.
If "A Student" will reflect a little be will see that it is impossible to prove that motion is not a cause of motion, and all the
experience of our lives goes to show that it is the cause of motion. Thus, then, it follows, according to Newton, that force and motion are synonymous terms, a conclusion which will perhaps tend to change "Student's" estimate of the value of the definition by Newton, Rankine, Moseley, \&c., of the word force. Hewill also, per-
haps, begin to see by this time that words ought not to be used intexthaps, begin to osee by this meanings conveying no ideas are attributed His illustration drawn from electricity is not to the purpose. We do not know what electricity is, but we do know, or, at all events, we think we know, with great precision what is the cause of
motion. Whether that is or is not force depends on the mean-
there is no difficulty, because force means anything that causes motion. "Student" favour me with his idea of what was passing through the minds of Newton, Moseley, Rankine, \&c., when they penned their definitions of force? Does he suppose that they had motion in view as one at least of the causes of motion? or was the
word force associated in their minds with effort, such as pushing or pulling? Plarmes, Ghent, September 11th. INDICATOR RIGS.
SIR,--In the issue of THE ENGINER of August the 24th, I
noticed an abstract of a paper on the comparison of indicator oticed an abstract of $a=b$, then $a^{2}-b^{2}=a b-b^{2},(a+b)$
rigs, ending thus: Given $a=b$, Nor $2=1$. Now everyone who is $a-b)=b(a-b) a+b=b$, or $2=1$. Now everyone who is
but a little familiar with mathematics, or rather with common but a attle faill in this case easily find out where the mischief is; but here are other instances, where the course of an absurd resul cannot be quite so easily detected; for some time ago I came across the following instance, which might be of interest for some
of your readers :of your readers :-


Given trapezium $\mathrm{ABCD} ; \mathrm{AB}=a ; \mathrm{CD}=b$; prolongation $\triangle \mathrm{D}$ and BC , and the line F E are drawn, we get $\mathrm{BC}=\mathrm{C} g+$ $\mathrm{H}+\mathrm{HB}$, or for converience $\mathrm{CB}=c+d+f$.
The triangles A H B and CHD give us:
$\frac{\mathrm{A} \mathrm{B}}{\mathrm{CD}}=\frac{\mathrm{B} \mathrm{H}}{c g+g \mathrm{H}}$ or $\frac{a}{b}=\frac{f}{c+d}$
The triangles $\mathrm{E} g \mathrm{C}$ and $\mathrm{B} g \mathrm{~F}$ give us :

$$
\frac{\mathrm{E} \mathrm{C}}{\mathrm{BF}}=\frac{c g}{\mathrm{BH}+\mathrm{H} g} \text { or } \frac{a}{b}=\frac{c}{d+f}
$$

Then $\frac{a}{b}=\frac{f}{c+d}=\frac{c}{d+f}=\frac{f-c}{(c+d)-(d+f)}=\frac{f-c}{c+d-d-f}=$ $-\frac{f}{-}=-1$, or $a=-b 1$
Leiston, December 4th. Ernest Boulard. RAILWAY EXPLOITS.
Sir,-After reading an amusing paragraph among your railway items in the current number of The Enginerr, in which you say that bridge jumping is used up, but that the baby-savin Yankee juvenile by a locomotive fireman, I was pleased to see by enclosed paragraph from the Evening News, that the bridge jumping exploit is not yet extinct after all, having merely been
transferred from the New World to the adopted country of
" The Las :- Circunstancias of the town of Reusi, Catalonia, reports an admirable instanoe of presence of mind. The insurgents of Santo Domingo della Catzado set on fire the railway bridge at
Haro. While it was in full blaze a train came dashing towards it, faro. at the last moment. An instant's thought showed them that it was too late to attempt to stop the train. If the brakes had been used the train would have come to a standstill in the middle of the burning bridge. So they decided to put on full steam and dash
through the flames, as the safer course. This was accordingly done, and the train arrived safely on the further side of the river. A few minutes later the burning bridge fell in, and if the speed of the train had been slackened, the whole would have been precipitated into the depths below.
You will see that the engineer and firemen both are credited with "admirable presence of mind" on this occasion, instead of
LoNG Bow. Reading, September theth.
Readng, september 1ew minutes" spoil the whole thing. The bridge ought
LThe "f to have fallen the moment the last carriage was safe. It is most vexatious that a good story should be spoitris sucha neglect of smal
details. There are really no trifles in stories of this kind.-ED. E.]
FOREIGN COMPETITION.
SIR,-I have read with considerable interest your editorial SIr,-I have read with considerable interest your editorial wost possible way to deal wing man understand what it is, and this can only be done by taking him abroad," I would propose that the Amalgamated Society of Engineers, as well as that of the Foremen Engineers, should at once send one or two good men drafted from various shops to the Amsterdam Exhibition. They would then, as you truly state, see that there are as good workmen in the world as
any that England can turn out. There are exhibits there of some of England's latest industries produced at such a figure as to debar us from competition on the score of cost. ONCE A WORKMAN.
London, September 10th.
Pollution or Streams. - An interesting case has just been tried in the Supreme Court, U.S.A., involving the right of the city of Rochester, N.Y., to discharge sewage into a natural watercourse
flowing through the suburbs and the surrounding country. The flowing through the suburbs and hiver, flowing north into Lake city is divided by the Genesee River,
Ontario, the land on the east side sloping to the north and east. The river is the outfall for all the main outlets on the west side, and part of those on the east side. There still remain four large
outlets draining an extensive territory on the east side that have outlets draining an extensive territory on the east side that have their outfall into the natural watercourses above mentioned.
Numerous suits have been brought against the city at different Numerous farmers, through whose lands these streams flow, for the overflow and consequent damage to crops, and the city has generally been beaten, but never before for the pollution of the streams by *ewage. The streams had been utilised principally for watering
live stock. The plaintiff claimed that the city had turned into the live stock. The plaintiff claimed that the city had of sewage, which stream running through his farm a large quantity of sewage, which
befouled and polluted said stream, thereby decreasing the rental value of his land. He claimed to recover the difference between the rental value of his farm, before and since the sewage was thus turned
upon it, before the year 1879. Judge Rumsey, in his charge to the upon it, before the year 1879. Judge Rumsey, in his charge to the
jury, said that the land of the plaintiff, lying as it does below and subject to the drainage of land lying in the city, is bound to receive subject to the drainage of land lying in the city, is bound to receive
the natural drainage of the land which would customarily and naturally flow into it. He is bound to receive the natural drainage of the land above him ; but he cannot be compelled to take
any more drainage than flows by reason of the natural shape of the land, nor can the people above him turn anything into the stream which would not naturally flow there if left to its ordinary course. They cannot increase the area drained, the amount of the drainage, or send down into the stream any waters or things that would not naturally flow there. It the jury found the rental value of was entitled ore the sewer was opened, and the rental value as it was after the sewer was opened. The city claimed that the renta value was actually increased, as there was a great amount of stuf carried into the stream, and there was not enough water to carry it off. But through the turning stream, it was washed out and the orks and otitted. The city had used the stream for an outlet from 875 to 1878 inclusive. The jury returned a verdict for the plaintiff for 600 dols, -The Sanitary Engineer,


FOREIGN AGENTS FOR THE SALE OF THE ENGINEER.



## TO OORRESPONDENTS.

** In order to avoid trouble and confusion, we find it necessary to inform correspondents that letters of inquiry addressed to the
public, and intended for insertion in this oolumn, must, in al writer to himself, and bearing a 1 d. postage stamp, in order that No notice will be taken of com forvarata to their destin cioion. ${ }^{\text {with these instructions. }}$ must therefore request correspondents to keep copies.
${ }^{\text {Al }}$ Al letters intended for insertion in THE ENGINER, or *taining questions, must be accompanied by the name and addres of the writer, not necessarily for publication, but as a proof of
good faith. No notice whatever will be taken of anonymous communications.
A. S- Consult the Patent Act, published in our columns.







 SAWDUST PRESSERS. SIR,-Will any reader kindly tell me who are makers of presess for
preesing sawduta and onp into firelighters?
London, September hith.

WIRE-WORKINGMAUHines.
(To the Editor of The Engineer.) SIR, - Can any of your readers give the name of some manufacturers of
ENquirks.

## noisy gearing.

(To the Editor of The Engineer.)




## STEAM HAMMER TUPS.






 throwing the extra strain immediately above the dotetail where they
break $k$ Indertand hat some firms are now using the ball conneetion
so as to allow the
 William Palliser took outa a patent for armour. plate bolts, which consisted
in diminishing the eite of bolts immediately betre the thread commenced
to orgive them some elasticity, which proserved them from breaking from
Jibrotion
when struck by shot. Will the eame reasoning apply
to the
 of your numerous readers would oblige me with the
ad vice, and what they think the the the diferent systems.
S. aybridge, September sth.

## SUBSCRIPTIONS.




## A complete set of The Enainerr can be had on application.




practical reoplarity, but repularity cannot be guaranteed in any such case.
All except weekly advertisements are taken subjeect to this oondititon.
 paper are to be addressed to the Publither, Mr. Georye Leopold Riche;
other leters to be addresed to the Bditor of THE ENOINERR, 163, Strand.

## THE ENGINEER.

## SEPTEMBER 14, 1883.

the marine department of the board of trade. The Times of Wednesday contained an article on "The Mercantile Marine and the Board of Trade," which say unsaid that is equally worthy of utterance. Although the article is anonymous, there is no difficulty in identifying the writer with a well-known and eminent authority on what he has written concerning the relations which exis between shipowners and the Board of Trade, but rather to extend and supplement his criticisms. He takes a well-known circular by Mr. Chamberlain as a text, and hows that not only is the marine department of the Board of Trade incompetent for the duties which it professes to perform, but that it is quite aware of the fact, and begs to be relieved of further responsibility. Our contemporary confines his remarks almost exclusively to the consideration
of the action taken by the Board in stopping ships which action taken by the Board in stopping ships that the officials of the Board really do not know what makes a ship unseaworthy, and are therefore helpless. Concerning the question of load line he is simply cathing in his criticism; and the sting of his criticism les in the fact that it is all based on admissions made by the Board. Thus, for example, we find in Mr. Chamberlain's circular the following passage:- "When a ship is topped, or when an owner is apprehensive that his ship will stopped, he not unnaturally applies to the Board of Trade to give him a load-line, or otherwise specify what it is that the Board of Trade require. This the Board of Trade have hitherto refused to do, because it is not their business to fix a load-line, or otherwise instruct shipowners s then business, but only to interfere when law is broken. A more absurd statement than this will not it we fo if the Board if inn defne what plied with. Of course, whenever the Board of Trade asserts that a ship is too deep in the water, it virtually hat if tha that if the ship were not quite so deep she would be suffered obviously just the province of a Government Board to say that such and-such a mus have such-and board to say board, and less The muse put forward by the freeboard, and not less. The excuse put forward by the Board which will apply to all sorts of ships. Of course they have Wot. No rules of the kind could be prepared or used can decide in each particular case what is and what is not right. but such men would demand and have a right to gight; but sleast twice as large as those now a right to, Board. We have not the least intention of disparaging the Board of Trade inspectors, They are, as a rule, honest, worthy men but they are not the right men for their work The want of good men has done more than anything else to bring the Board into disrepute. We cannot agree with the writer in the Times who can see no wrong thing in the action of the heads of departments, and lays all the blame directly on system, and indirectly on subordinergies in forcing crotchets on the shipowners of the king dom, they cannot be held blameless. In the case of load ines it may be said that too little has been done; in the case of marine engineering and shipbuilding a great deal too much. Thus, not many years have elapsed since an order was issued by the Board, insisting on the use of gun-metal closet fittings, although cast iron had been used from the beginning, and not a single instance of the dangerous ailure of cast iron pipes could be found. The author of his wise order raised a storm among the shipowners and builders which was not readily allayed, and ended in the efeat of the Board
The rules for the strength of marine boilers are laughed at by the engineers who are compelled to follow them. It re not in the raffic of the kingdom would be stopped. There is no now at work a locomotive carrying 130 lb , to 150 lb pressure, which, were the rules for marine boilers applied to them, could be passed to carry more than 60 lb . The Board, too, continually steps in and stops improvement A case came under our observation the other day in which high-speed passenger steamer could not be constructed on certain lines, because the Board of Trade would not pass boilers which were oval, or more properly flat-sided vertically. Cross stays were introduced, according to the ends of a boiler ; but the Board for was ine staying of the flat believing that there must be some broad difference between the flat side and the flat end of a vessel intended to sustain interior pressure. Again, there is not a marine engine builder in the kingdom who has not had the soul vexed within him by troublesome stipulations about superheaters, the opening up of engines, the examination of crank hafts, and such like; and with all this ill-directed zeal derts in passed Mr, Chamberlain in permitted to go to sea.
Mr. Chamberlain in his circular says:-"There is no rule, no scientific principle, which can be invoked to determine whether any given ship is or is not unseaworthy. Nor is practical experience unanimous. The best experts case. Coner stop a ship-still more when they have to prosecute-they
are in the utmost difficulty. Their own advisers may no agree with the assessors or the Wreck Commissioners." It is, we think, a very fortunate circumstance that the Board of Trade has not more rules to fall back upon. It officers have never yet manifested any special aptitude for the framing of rules, and what they have done in this way has tended not a little to bring the marine department into disrepute. We may cite, for example, Sir Digby Murray's "approximate tables of Free-
board," than which nothing more ridiculous has ever been produced by a Government department. Sir Digb Murray did his best according to his light to solve a difficult problem, but he failed disastrously, because he lacked the requisite knowledge. It has been said of these tablestha the ease with which they can be departed from was thei chief recommendation. Again, what do our readers think of the rules for granting passenger certificates to steamers ply ing in inland waters? For every square yard of deck space they may carry one passenger-that is all. A Thames steamer may have a bottom no thicker than brown paper she may be without a water-tight bulkhead; her frames may be few and far between; her whole structure so slight that a touch by a barge will send her to the bottom but provided she has 600 superficial yards of deck space and her boilers and safety valves-especially the safety valves-comply with certain conditions all laid down by rule, she may carry 600 passengers. What may happen the fate of the Princess Alice tells us. Again, a sea-going steamer, if she carries more than twelve passengers and has engines over 100-horse power nominal, must have an If If she carries eleven passengers only, she need not have engines are under 100-horse power. In the Merchan Shipping Act, 1862, the term nominal horse-power is used to settle what grades of engineers shall be carried, but no rule for calculating it is laid down. A MerchantShipping down for account only the diameters of cylinders and piston speeds account only the diameters of cylinders and piston speed without regard to pressure. pre priple The owne Board act in setting the power of angine. The owner, so fa insten see, main a 130 mol pustan, 1 ling to on Lloyd's register as 99 -horse power, in order that they may avoid the expense of carrying a chief engineer
It is the Mr . Cham
In session to remodel the marine departed, but Board of rade Nothing less could be expected; but the remodelling satisfactory principles. The great want in the department is intelligence; its great defect is red tape; its greatest drawback small salaries. Nothing will do much good that falls short of the introduction of new blood. The marine epartment as it stands is a fossil, interesting but useless, if not in the way. An efficient Bureau of Shipping migh become not only an extremely useful but even a popula institution, capable of doing a vast amount of good to the sailor and the shipowner alike. It might inaugurate and arry out a great many improvements now much wanted It might guide and assist the shipbuilder, the naval archi oct, and the marine engineer. Loyd's supples an example We are glad that Mr. Chamberlain contemplates aphish but we have reason to fear that his change will not be in the right direction. Nothing can make the department what it ought to be but competent men; and these cannot be had for salaries based on the existing scale. The idea hat any kind of rules or any species of system will com and any action taken on such an idea will only end in dis appointment and loss.

## the depreclation of factories,

We give on another page the first of a series of articles on the depreciation of factories, the elucidation of which may be interesting to some of our readers. The financial proprietors-demands at the present time of large under takings and joint-stock companies an attention in regard to ertain details beyond that which might serve the purpose of private firms. A few partners sharing in the management of their business may, at their discretion, adopt any ystem of account-keeping they please, and may be content with incomplete and even erroneous methods so long as their affairs appear to prosper. But there is always the danger that with an apparent profit at the end of the year the operations which have gained it may not be closely enough examined ; and, in the absence of an exact analysis, it sometimes happens that a branch of manufacture is carried on at a loss, unrecognised because hidden under the general gains of the factory. The main items of expendiure in the engineering trades are materials and labour and while these vary in their proportion to each other, according to the precise nature of the business conducted, they vary as much or more in regard to that third main item of cost, which, under different names, is made up of rent, manage ment, and general expenses. One fertile source of error in the accounts is the too ready generalisation with which the annual total of these expenses is divided over the output of the year, for if, as often happens, each transaction is charged an equal percentage, it is obvious that certain hare really due to the charge was fined to the one kind of operation. A correct analysis of the past, while necessary to ascertain the profit or loss which may have accrued, and to a division of it among partners, is of still greater importance as providing a basis on which estimates of cost for future transactions can be based, and in the case of competitive tenders, those who know the facts correctly can alone in the long run succeed. At first sight it might appear as though the risk lay only in the proper allotment of the charges, and that at any
rate there should be no difficulty in ascertaining how much
had been spent during a past year. In regard to direct money expenditure this may be so ; but the deterioration of the factory itself, and the wear and tear of the machinery by which the revenue has been earned, do not admit of is great, blation, and the danger arising from a wrong system is great, because many years may elapse before an error is
discovered. There is too often a disposition to regard as profit the surplus of receipts cver expenditure without neering trades is of so varied a character as to admit of no fixed rules for measuring and recording it. If too little be set aside for the renovation of buildings and the purchase of new machinery, the so-called profits of a year may be entirely fictitious; while if too liberal a provision be made out of gross earnings the present owners may be prietors. The physical deterioration of the machinery has not alone to be considered. New inventions may render machinery obsolete; patent rights and monopolies may expire and throw open a trade to those who will have the advantage of starting with later and improved processes; and manufacturers may find that what they have been dividing as profit may
All manufacturers recognise the deterioration of their plant, but the very great diversity in the method and extent of meeting the loss and of providing for renewals Of course the error may be in either direction. There may be a lavish writing off for wear and tear, far in excess of the real loss, and while this may, in the case of a private firm, be an excusable and, indeed, a prudent course, it is none the less erroneous, and in the case of a joint-stock company may be unjust to present shareholders, who, if unacquainted with the system under which their property is depreciated, may be led to sell their shares at less than their real value to those who have a fuller and perhaps glad if the articles on this subject to which we draw atten tion may elicit some discussion as to the practice in dif ferent branches of the engineering trades, which may be serviceable to our readers.

## COMPOUND LOCOMOTIVES.

In our impressions for August 3rd and 10th we published complete drawings of Mr. Webb's compound locomotive and a full description of the engine and a statement of its
performance written by Mr. Webb himself. In our impresperformance written by Mr. Webb himself. In our impres been done in the same direction in Germany. Our reader are, as a result, in possession of all the most recent avail able information on the subject, If there is not more to be had, that is not our fault, but the result of circumstances over which no one has much control. He would, we think,
be a rash man who without hesitation condemned the be a rash man who without hesitation condemned the No one possesses as yet the data necessary to enabl a final conclusion to be formed as the result o our judgment until events develope themselves. But there are certain aspects of the questions involved which not only admit of being discussed, but which really demand discussion at this moment. Thus, for example, Mr. Webb has now, or soon will have a dozen of his engines at work, and on the results obtained with these a great deal
may depend. In such a case as this the inventor is by the nature of things practically debarred from giving evidence No disrespect will be meant, but nothing which Mr. Webb could say regarding his engines will be accepted as conclusive unless he can support his statements with
well authenticated facts, and such facts must also be perti-nent-a point very frequently overlooked by inventors Thus, for example, Mr. Webb may state that his com pound engines are burning but 26.6 lb ., as compared with 34.6 lb . with non-compound engines on the London
and North-Western Railway. Now, we have here an example of what may be termed the non-pertinent statement. In other words, such a fact has by itself little to do with the question at issue, which is, is the compound locomotive more economical than the non-compound The railway ore arge does not care a great deal it ne engine on the London and North-Western Railway is system ; but it does want to know very much if the com pound type of locomotive is more economical than any other pound type of locomotive is more economical than any other
type. To put this more clearly, we may say that while we accept Mr. Webb's statement that the compound engine is burning but 26.6 lb . of coal per train mile, or engines, we can add the colne engines, we can add that there are non-compound same conditions of load, speed, and gradients, which are getting on perfectly well with about the same quanHere the if type of non-compound, we find that it is very much type of non-compound, we find that it is very much
more economical; if with another, we find that it possesses no advantage at all. But this is not all. No comparison of the kind can be complete which omits a statement of the quality of the coal burned. If Mr. Webb is using cheap coal, and his non-compound rival dear coal, then the Webb. There is yet another point for consideration How does Mr. Webb arrive at his results? Does he trust his drivers, or has he an independent inspector riding constantly on each of the new engines, and reporting on it performance? It is obvious that the men driving these them do well, and there are more ways than one, as every locomotive superintendent knows, of making an engine give a high duty. Of course we do not assert that due care has not been taken to get accurate results ; but neither Mr. whom his invention appeals to be satisfied with anything short of a clear and detinite statement of the precautions taken to obtain unimpeachable figures, Mr. Webb himself would be satisfied with nothing less as regards the inven-
tion of any other railway engineer; and we have no doubt ap to the present this kind of infly all that is wanted; but judgment must therefore be suspended.
The whole system may be dealt with on a theoretical basis. Why, we may ask, should a compound be more economical than a non-compound engine? It is notnecessary, fortunately, to enter into any discussion here of the merits tion compound system in preventing cylinder condensaAn ordinary high pressure when it is hard worked. Thus an engine with 18 in . cylinders, 24 in . stroke, will deliver at each end of each stroke about 3.67 cubic feet of steam into the chimney, and this steam will have a total pressure, according to the speed of the engine and the point of cut-off, of from, say, 100 lb . on the square inch down. It is not likely that it will fall much below 25 lb . above the atmosphere when the train is fairly heavy, unless on a falling gradient We have here, then, absolutely wasted nearly $3 \cdot 75$ cubic eet of steam per stroke. If the cylinder were augmented in length, then it is clear that the steam might be permitted to follow the piston further, and so falling to a lower pressure give out a great deal of power. In other words, compounding a locomotive means nothing more than augnot quite a fair statement of the case, because in some instances the cylinder capacity has remained unaltered This is only an apparent exception, as a smaller weight of steam is used at each revolution of the driving wheels in such a compound engine as that of Henschel with two cylinders only. Thus it is clear that the cylinder capacity ncreasually augmented; in other cases it is actually up to a certain point by simply putting in larger cylinders Thus, let us suppose that an engine with a given boiler power has cylinders 16 in . diameter and 24in. stroke. If, in, these are removed, and a pair of 18 in . cylinders put in, the effect will be that of compounding. The engine The experin much more expansively than it was before unsatisfactory results that the cylinders have usually been ined up again ; but the reason was usually that the load was increased at the same time that the cylinders were enlarged, and the engine performed worse than ever, because the boiler could not keep steam for the extra play, there tu. If such experiments had had fai not, then the perhaps have been a saving It must never be forgotten that the conditions unde which a locomotive operates are of paramount importance in this connection. As a rule, passenger locomotives of the best type are so designed and loaded that very little wor indeed is left in the steam as it escapes up the chimney. A glance at the diagrams taken from such engines wil show that at high speeds expansion cannot be pushed
further with advantage. The case is different with further with advantage. The case is different with goods engines. We constantly find them hauling trains power wasted such engines ap the chimney is then very greatindo. To be invaluable. But for reasons very well understood, it is highly desirable that the increased capacity should be supplied rather by augmenting the number of cylinders
than by increasing their diameter. Much is to be hoped, than by increasing their diameter. Much is to be hoped, we think, from compounding goods engines. With them in the case of the passenger engine We may call atten ion here to the noteworthy fact, that while passenge engines exert daily a greater horse-power than goods
engines, they burn much less coal per train mile, and the eason the passenger engine is seldom or neve un in full gear, while the goods engine does the 50 or 60 per cent. of the stroke. By augmenting at least opacity per cent. of the stroke. By augmenting cylinder capacity this would be avoided. The use of bigger cylinalso would be worked in full gear. The great advantage of the compound system is that the driver may do what he inases, he cannot help work his steam expansively; and will be found, we believe, the secret of all the economy that can fe realised by ive engine at all events.

## SEISMIC FORECAST.

Somebody-whether lady or gentleman we know not we presume the latter-writes to a daily contemporary to say that having for some time past been engaged in tracing the causes of seismic disturbances, he was enabled day or two of serious ebullitions of natural forces" within day or two of the date of the recent earthquakes in Ischia and Java. Of course, we may take the gentleman's word fort; but he also affords us some test with regard to his qualifications by predicting that "earthquakes and volcanic eruptions, probably of a heavier and more serious preseter the present year, will happen on and within a few days of the 2nd inst." Unfortunately, the learned gentleman is anable to say in what parts of the world these disturbances will present themselves. Accordingly, the inhabitants of all those regions where earthquakes and volcanoes are But this is not a satisfactory state of things. The earthquake oracle should be more precise. The prediction i most like " a hurricane somewhere." In these matter-of act days people require something definite. Our fore fathers were content when "Francis Moore, Physician," redicted "Thunderstorms in places," and "Rain on o bout the 5th, 12th, 23rd, and 30th." We have got beyond this infancy of knowledge, and now we learn in
the morning that before the day is out the wind will be me morning that before the day is out the wind will be north in Scotland, west in the Midland counties, with a brisk little gale in the Channel, and showers in the North
of Ireland. This is business, But "earthquakes somewhere" is irritating, because at once exciting and vague. where" is irritating, because at once exciting and vague.
We should be told of "tremors in Greece", "undulations
from the north-west in Syria," and " violent agitation about the base of Cotopaxi." If the seer could add "minute ject would be considerably enhanced, especially with regard to the equilibrium of Cleopatra's Needle. But London has its own peculiar seismic phenomena. should say that never was there such a general upheaval of the surface since the settlement of the British strata. Wood, asphalte, Purbeck, Portland, and granite, appear disorganised. In a November ands, all alike complained there was "no t'other side the wood, At the present hour there seems to be neither this side nor the other. Chided by the press for uprooting the authorities seem determined to hold high revel "ont of season." There is a fiction that "London is "out town." Consequently, an army of men with pickaxes and crowbars have torn up almost every inch of pavement, and nobody." Let the hapless citizen take his stand on "the finest site in Europe," and look down Parliament-street. The scene is chaos, having in the midst a huge cauldron emitting grimy clouds reeking with pitchy odours. The The peripatetic is made to feel the street that is not? intruder. The man with the wheelbarrow frowns upon him. The gentleman with the shovel evidently meditates mischief. If the wanderer turns aside in search of quieter scenes, it is in vain. The most secluded nook is under unknown it the era of barricades. Omnibuses pursue of looking for them. The be found where nobody thinks be inferred from the fact that an unfortunate cabman having preserved an unblemished reputation for thirty years, became aggravated to such a pitch of indignation by the difficulty of finding his way from the top of the Haymarket to the Waterloo Station, that he swore at his fare, and was fined by the magistrate. If everybody who is exasperated at the incomprehensible blockade which fashion now suffers were dealt with after the same consid, the sum total of the penalties would perhaps be things. But Earthquakes, no doubt, are very dreadful surface in the midst of the metropolis are excessively It is to be hoped that amid all the varieties of roadpaving in which the authorities are indulging, a discovery will be made of something so permanent in its character that this kind of visitation will not be continually repeating itself. There is a striking analogy between the true seismic convulsion and this wrecking of the uphoughfares. There is sure to be now and then an wherval of the surface, but the difficulty is to know of the prophet in our conte. are no help in this matter. The only plan is to go and consult the vestries, and then it may be possible is not alw on the whole it is somewhat easier to study the cosmical than the parochial. But it is a fact to be considered and inquired into that the roads and footways of London seem raftiar out faster than ever they did. No doubt the roles and trenches now than more occasions for digging disturbing trenches now than formerly. The latter is a whetleng cause of great potency; but it may be doubted anderstood in relation to the requirements of the metropolis. At the rate at which things are going on, we seem already the comparison is not utterly remote, so far as the arrest of locomotion is concerned.

EVOLUTION.
One of the curious waves of change which scientific thought frequently exhibits appears just now to be impending concerning
the theory of evolution. The President of the American Association for the Advancement of Science, Principal J. W. Dawsotook as a text for a recentaddress, "Some Unsolved Problems in Geology," and without disputing the Darwinian theory, he warned his hearers that it might be well to suspend thei
judgment in certain matters. One difficulty, for judgment in certain matters. One difficulty, for example,
the speaker pointed out, lies in the remarkable fixity of the leading types of living beings in geological time, we take the trouble, with Barrande and Gaudry, to trace the form f life through the period of their existence, each along its ow line, we shall be greatly struck with this, and especially with vicissitudes of physical conditions of the most stupendous cha racter, and over a lapse of time scarcely conceivable. What i till more remarkabse is, that this holds in groups which within certain limits, are perhaps the most variable of all. equally noteworthy. The pattern of the veination of the wings cockroaches, and the structure and form of land snails, gally oniferond decapod crustaceans, were all settled in the Car and the fructification of club-mosses and ferns. If at any time members of these groups branched off, so as to lay the foundations of new species, this must have been a very rare and excepthe ordinary laws of nature." Dr. Dawson does not stand alone. Pofessor Williamson, of Manchester, in an address delivered in ebruary last before the Royal Institution of Great Britain have no known ancestry, uses the significant words, "The time has not yet arrived for the appointment of a botanical king-atwritten in an extremely thoughtful. Dawson's entire addres ished in full in Nature, and will be found well worth perusal.

## an electrical patent case.

The original patent for the Gramme dynamo electrical machine will expire in a few months, and the fact that one of the best
lighting, but on the value of other patents. The owners of the lighting, but on the value of other patents. The owners of the Gramme paut of the invention, and they have recently brought
they can
an action in the United States to establish their rights. The case has at last been brought to final argument before the United
States Circuit Court, at Newport, R.I. If the patent is States Circuit Court, at Newport, R.I. If the patent is sus-
tained, it is supposed that many of the dynamos now running will be found to be an infringement-in which case the Gramme owners will make a rich hanl. One of the most serious points
urged against the plaintiffs is that the machine was patented in Austria prior to the grant of the American patent, which
Austrian patent has expired. Under the American law the Austrian patent has expired,
American patent ceases with the expiration of the previouslyAmerican patent ceases with the expiration of the previously-
granted foreign patent for the same invention, and if this patent
has been clearly proven, the decision must necessarily be adverse has been clearly proven, the decision must necessarily be adverse
to the validity of the Gramme invention. It is expected that
geveral weeks will elapse before the judgment of the Court will several weeks will elapse before the judgment of the Court will
be delivered, be delivered.

## LITERATURE.

The Concepts and Theories of Modern Physics. By J. B. Sraslo.
Second Edition. London: Kegan Paul, Trench, and Co. 1882 .
[Second Notick.]
We have shown in our first notice of Dr. Stallo's book that the atomic theory as held by chemists is in direct contradiction to the atomic theory as held by physicists-we
use the word physicist for lack of a better, to express what has been called "the man of pure science," namely, one
who deals with nature and nature's laws on the broadest principles-on the question of weight. In his fourth chapter our author goes on to deal with the proposition
that the elementary units of mass are absolutely hard and inelastic; and in consonance with the general plan of his book he first quotes authorities to show that such a view
is held or has been held-" Elasticity involves motion of parts, and cannot therefore be an attribute of truly simple atoms" "The concept 'elastic atom,' says Professor
Wittwer, is a contradiction in terms, because elasticity presupposes parts, the distances between which can be
increased and diminished." Sir Isaac Newton in his "Opticks" says, "It seems probable to me that God in the beginning formed matter in solid, massy, hard, impenetrable, movable particles, of such sizes and figures, and with such
other properties and in such proportion to space as most conduced to the end for which He formed them; and that these primitive particles being solids are incomparably harder than any porous body compounded of them, even
so very hard as not to wear or break in pieces, no ordinary so very hard as not to wear or break in pieces, no ordinary
power being able to divide what God himself made one in the first creation." Dr. Stallo has not found it necessary to quote many authorities. Indeed the doctrine that the
ultimate atom is quite hard, rigid, and inelastic, is invariably taught so long as the student is dealing with the constitution of matter. But Dr. Stallo goes on to show that
the moment we come to deal with the kinetic theory of gases a totally different doctrine is of necessity taught, if not directly then by implication. Mr. Stallo says:-
"The most conspicuous among the hypotheses which have
deevised since the general adoption of the modern been devised since the generat, adoption onetism, modern the
theories of heat, light, electricity, and magne the the the thent
establishment of the doctrine of the conservation of energy,
in pretation of physical phenomena, is thit known as the kinetic
theory of gases. In the light of this theory a gaseous body
is a swarm of innumerable solid particles incessantly moving is a swarm of innuumerable solid particles incessantly moving
about with different velocities in rectilinear paths of all conceiv-
able directions, the velocities and directions being changed by able directions, the velocities, and directions being changed by
mutual encounters at intervals, which are short in comparison with
ordinary standards of duration, but indefinitely long as compared ordinary standards of durvation, , but indefinitely long as ocompared
with the duration of the encounters. It is readily seen that these
mot motions would soon come to an end if the particles were wholly
inelasti, or imperfectly elastic. For in that case there wuold be
loss of motion at every encounter. The assumed perpetuity of the loss of motion at every encounter. The assumed perpetuity of the
motion of the particles, therefore, leads to the neeessitit of assert-
ing their pertect ing their perfect eleasticicty. And this necessity resusstts, not mererty
from the peculiar exigencies of the kinetic theory of gases, but also
from from the peculiar exigencies of the kinetic theory of gases, but also
from the principle of the conservation of energ in its general
application to the ultimate constituents of sensible masses, if these
constitenents consitiuents are supposed to be in motion. In the case of the
collision of ordinary inelastic or partiall elastic bodies there is a
los on motion which is accounted for by the conversion of the motion thus lost into an agitation of the minute parts composing
the colliding bodies. But in atoms or molecules destitute of parts assume that the ultimate molecules of a gaseous body are absoassume that the ultimate molecules of a gaseous body are abso-
lutely elasti. The necessity of attributing perfect elatictity to
the elementary molecules or atoms in iview of the kinetic theory of
 statement is adopted by Clausius + and emphasised by Maxwell,
 perfectly elastic spheres.'. And the highest scientific authorities
are equall sxplicit ind
or molecing that the hypothesis of the atomic of the conservation of energy, unless the atoms or molecolese are are
assumed to be perfectly elastic. © We are forbidden, says Sir
William Thompson, $\$$ " by the modern theory of the conservation of energy to asssum, in "by the modern theory of the conservation or anything short of perfect elas-
ticity of the ultimate molecules, whether of ultra-mundane or ticity of the ultim
We have here a glaring contradiction, and that such a controrts have been made to escape from the horns of the
enists has een full recognised, and vigorous dilemma-among others, by Helmholtz and Sir William recondite theories advanced, according to which vortex
rings and rings in a perfect fluid may be said to supersede the gas
atom. It is, of theory is a mathematical abstraction which will not bear even keen mathematical discussion. Indeed, so great an
authority as Clerk-Maxwell has pointed out that vortex rings moving in a continuous fluid would lack the essential attribute of matter, inertia. Sir William Thomson does with the problem, and left it where they found it. Let us see exactly what all this implies.
form the theory that the pressure first to put in a popular violent impact of the gas atoms on the sides of due to the ing vessel. Let us suppose that we have a membrane like
\& Pog. Ann., vol. xcix., p pic.
a drumhead stretched loosely on a hoop. If, now, a shower of parched peas were permitted to fall on the membrane, held horizontally to receive it, then it requires no great quite tight. There would be no accumulation of peas 'on
the nearly flat surface ; but their almost continuous impact the nearly flat surface; but their almost continuous impact
would have all the effect of pressure. Joule, long before Tyndall lectured on the subject, had recourse to this theory to explain certain thermal phenomena resulting from the compression and expansion of gases. We shall not err if we say that if we reject the atomic collision theory of gases, we have no theory at all concerning them which
will hold water. But, on the other hand, this theory and the proposition that the ultimate atoms of matter are hard and inelastic cannot go hand-in-hand-either must be
wrong if the other be right. The physicists may sing, like wrong if the other be
Captain Macheath-

## How happy could I be with either, Were 'tother dear charmer away."

But unfortunately both the theories appear to be indispensable to that kind of universe which modern science has built up and teaches the nature of laboriously to the rising generation. To sum up what has already been said
in other words, Dr. Stallo shows, and that in a way which is entirely unanswerable, that what is commonly taught concerning the ultimate forms of matter is entirely incon-
sistent. Furthermore, the scientific world has carefully sistent. Furthermore, the scientific world has carefully
stopped every loophole by which it might have escaped. stopped every loophole by which it might have escaped.
The pure physicist can in no possible way dispense with The pure physicist can in no possible way dispense with
an ultimate atom, absolutely hard and inelastic, and invariably of the same weight; his universe is built up of such atoms, and of no others. To the chemist the atom is
equally necessary ; chemical science would be chaos without it. But the chemist's atom is quite different from that of the physicist. Indeed, instead of one kind of atom, he needs no fewer than sixty-three, or one species for each
element; and these atoms, instead of all being of the same weight as the physicist maintains, are all of different weights, varying from that of the hydrogen atom, which is taken as unity or 1 , to that of Thorinum, which is
$231^{\circ}$. To the chemist again it is a matter of perfect indifference whether the atom is or is not elastic, but he demands that instead of being inert it shall have certain affinities, desires, wishes, so to speak, which
result in the production of definite substances from definite mixtures. Whenever substances, either elementary or compound, unite together chemically, they
always do so in fixed proportions, and these proportions are regarded as representing the atomic weights of the substances; and to proceed still further, these
natural tendencies of the chemical atom are so strong, that when the equilibrium of unstable mixtures is overset, as by heating gunpowder, the most violent mechanical effects are produced, and this by atoms which, according to the physicist, are absolutely inert. Again, the man who me chemist nor that of the physicist will answer his purpose. He cares nothing about hardness, inertness, or Thus, then, there are not less than three distinct kinds of atoms demanded by the modern teachers of science; and it is admitted on all sides that the conditions under which the atom of any one of the three can exist must be fatal to the this picture-that it is absolutely, astoundingly true the student who reads Dr. Stallo's book cannot help admitting. We have said enough, we think, to show very clearly what our author has to say on one of the foundations of modern physical science, viz., the atom. We may now proceed to consider other of his propositions.
tion of energy chapter Dr. Stallo deals with the conservatheory, motion, like mass, is indestructible and unchangeable. It cannot vanish and reappear. Any change in its number of units of mass; and motion and mass being mutually inconvertible, nothing but motion can be the cause of motion. There is, therefore, no potential energy; all energy is really kinetic." Now whether cuss for the moment. That it is held very generally
cor is certain. There are exceptions, but they prove the rule. the sole cause of motion, there can be no such thing as potential energy. But as a matter of fact, even at this moment, the is assurrines are taught side by side; and while the student cause of motion, he istold on the other that energy-which is motion-has been stored up in coal millions of years ago by the sun; and that a clock-weight when wound up years ago the inconsistency struck one able man as being
too glaring, and for "potential energy" we had substituted "energy of position." But underlying the whole structure of modern science we have the theory of the storing up of energy in motionless bodies. In our opinion this has conceptions of the nature of energy. Thus, for example, if it were admitted that motion is the only form of energy,
then it is clear that a motionless body could not store it then it is clear that a motionless body could not store it
up. But the word energy, like force, is used in the vaguest possible way at every turn. "Modern science," says Professor Stallo-
"Asserts that all, or nearly all, physical changes in the universe, energy is incessantly stored as virtual al pwer and restored as actual
motion. When the bob of an ordinary pendulum descends from its highest to its lowest point, its potential energy diminishes in proportion to the increase of its actual motion, when it rises again at its highest point opposite the first, where it is for an instant motionless, all its energy being due to its position. And this con-
version and re-conversion of the two forms of energy are typioal alike of the supposed oscillations of the ultimate atoms or mole
cules and of the orbital swing of the large bodies composing a planetary system. A planet moving in an excentric orbit gains
energy of motion as it approaches the sun and loses it again in the same proportion as it recedes from it. The same mutuan transfor-
mation is exhibited in another wide domain of physical -action due to chemical affinity. A lump of coal lies buried in
the earth for a million years; during all this time there is no
appreciable change in its position as referred to surrounding objects, appreciable change in its position assererred to surround external or
or in the relative positions of its arts -it is without
internal which it is a part: now we bring it to the surface into the atmosphere containing oxygen and in contact with a flame. Its latent power at onee becomes sensible - it burns, giving rise to vigorous
poction which manifests itself as light and heat. The tendency of action which manifests itself as light and heat. The tendency of
modern science is to trace all physical change to few primary modern science is to trace all physical change to a few primary
forms of potential energy, chief among which are gravity and chemical affinity. In the opinion of modern physicists the only
plausible theory thus far advanced of the origin of stellar and planetary systems is that known as the nebular hypothesis; and whether we adopt its familiar Kant-Laplacean form or one of its more recent modifications, in either case all the molar, if not the
molecular, forces of the universe are ultimately derived from the attraction due to the mere position of the original particles sup-
posed to be uniformly diftused in space. And all changes in the comparatively minute organic or inorganic forms are referred, proximately at least, in physiology as well as in physios, to the
affinities of the chemical elements. In truth, modern science affinities or the crity and change in the phenomena of nature are
teaches that diversity possible only on condition that energy of motion is capable of being stored as energy of position. The relatively permanent concre-
tion of material forms, chemical action and reaction, crystalisation of material forms, chemical action and reaction, crystallisa-
tion, the evolution of vegetal and animal organisms, all depend tion, the evolution of vegetal and animal organisms, al of epend
upon the 'locking-up' of kinetic action in the form of latent energy. To make ethis clear, and to show that the effort to abolish
the distinction betwen kinetic and potential energy is without avail, it will be useful briefly to review the history of the doctrine
of the conservation of energy.
We must refer our readers for the review referred to to Dr. Stallo's book. They will find it worth perusing. The demands on our space prevent us from reproducing it. It displays an enormous amount of reading and research on the part of the author, who quotes all his authorities at considerable length. It is, we think, clear that if the potential energy theory be true, then the theory that motion is, like mass, constant, must be false. "If," say
Stewart and Tait, speaking of Le Sage's theory of gravitaStewart and Tait, speaking of Le Sage's theory of gravita-
tion, "this, or anything of a similar nature, be at all a tion, " this, or anything of a similar nature, be at all a
representation of the mechanism of gravitation, a fatal blow is dealt to the notion of the tranquil form of power we have called potential energy, not that there will cease to be a profound difference in kind between it and ordinary kinetic energy, but that both will be henceforth regarded as kinetic." It is right to point out that long since the preceding passage was writen at least one able authority has re-asserted in the strongest language tmat
motion is the sole cause of motion, and so far as human motion is the sole cause of motion, and so far as human experience goes, motion is never set up in motion. Thus,
save by the contact of some other body save by the contact of some other in contact with the feather and puts it in motion. The motion of a rower's arms is required to propel a boat, and so on. The exceptions summed up under the head of at limited; they are all traction. Thus it is said that the earth attracts a falling body, and that we have in this way motion produced withou the contact of any moving body; we have socalled, of magnetism and electricity. But to the
tions, whole doctrine of attraction there are fatal objections, the first being that it is entipely opposed to the theory that matter is inert. So fully has this been recognised, that in order to get rid of the difficulty matter has been dispensed of force. The second objection is that the theory of
ond attraction is flatly opposed to the doctrine of the conservation of energy, according to which motion cannot be if a body at rest has motion communicated to it by another body also at rest, then motion has been created instead of being derived. In other words, it has been produced without any expenditure of energy, which is absurd. This is, have just said is strictly cognate to the matters discussed by Dr. Stallo.

COMBINED STEAM ENGINE AND FIRE PUMP. MessRs. Shand, Mason, axd Co., Upper Ground-street, Blackfacturers, Pheims used as a fire pump and for driving dynamo machines for electri lighting purposes, availed themselves of the opportunity of
designing and constructing an entirely new form of encine specially adented for this purpose. We this week give two illus stations of this engine, one being a side elevation showing the general arran elevation showing the automatic cut-off gear. The engine is of the return connecting rod description, with two piston-rods attached to the crosshead the latter beeng fitted with adjustable slipper blocks with large bearing surfaces. The connecting-rod is jointed to the centre of
this crosshead, and a serewed projection is formed for the purthis crosshead, and a serewed projection is formed for the pur
pose of connecting the outer end of the pump piston-rod by means of a nut, when the engine is to be used as a fire pump. It will be seen from the engraving that the bed-plate is of grea
strength, while the steam cylinder is overhung at one end and the fire pump at the other
The general arrangement of the valve gear is of novel design, governor of the Hartnell type, with several improvements. The main valve is of the ordinary description, driven by an excentric,
with the cut-off valve working on the back and at right angles to its line of mot valve working on the back and atrl narrow ports through it corresponding with similar ports on the back of the main valve, the stroke being short and the frictional i resistance
correspondingly decreased. The cut-off valve rod is connected at the upper end by links to one end of a rocking lever, to the latter having a pin forged on it with a bearing in the governor drum ; the excentric vibrates on this pin to the position for early and late cut-off. This pin has a lever keyed on its outer end, tric forged on a pin, on which is keyed one of the arms of the governor, this arm being connected by a link on which is the governor spring. This arrangement gives the governor complete control over the cut-off excentric, whilst the latter has no power to annect the position ofiche governor arms. With the engine speed was under twelve revolutions, although in the experiment the cut-off was varied in its full range from one twenty-fifth to five-eighths of the stroke. Self-acting lubricators are fitted to all working parts, the surfaces at the same time being made extra large with the revolving parts balanced. We need
that the finish of the engine is all that can be desired


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opolitan Board of









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THE IRON, COAL, AND GENERAL TRADES OF BIRMINGHAM, WOLVERHAMPTON, AND OTHER DISTRICTS.

## From our Correspondent.)

STEADINESS, with generally firm prices, characterised the iron market to-ayy
Hoop quotations varied greatly, ranging from $£ 8$ to $£ 910$ s.
Common hoops were based on $£ 610$. ton.
Sheets for galvanising were, for trebles, $£ 9$ 7s. 6 d . to $£ 9$ 10s.;
and doubles, $\pm * 7 \mathrm{~s}$. 6 d . to $£ 810 \mathrm{~s}$.; while singles for and up were easy to buy at from $£ 7$ 17s. 6 d . to $£ 8$. Sheets,
ing-u
galvanised and corrugated, were quoted by some firms at $£ 13$ 促. for 24 g ., and $£ 1510 \mathrm{~s}$. for 26 g . -all in bundles and delivery equal to Liverpool. The market very slightly firmer.
The ironworks throughout North Staffordshi
The ironworks throughout North Staftiordshire are more actively ou this week in the strip and hoop, and also the
Coal is in fairly good demand at firm rates.
Among the ironwork contracts under execution by engineering firms for mis district may be mentioned the furnishing of the iron-
work for Messs. Jeavons and Mellor's new premises in Corpora-
tion-street, Birming tion-street, Birmingham, which is being undertaken by Messrs. W.
M. Ward and Co., of the Limerick Foundry, Great Bridge, Tipton. M. Ward and Co., or the Lumeriok Foundry, Grear Briage jupton. pleted for the new baths in Monument-rood, Birminghain, orna-
mental arch ribs for carrying the roofs, all the girders, and other general ironwork of the buidding, including the hot water arrangements, the whole contract being worth about $£ 3000$. A contract
worth about $£ 7000$ has been successfully filled by the same firm for wrought and cast ironwork, including girder
in the fitting up of the Rubery- hill Ayslum.
The operative delegates of the twelve districts represented on the
South Staffordshire and East South, Staffordshire and East Worcestershire Mill and Forge
Wages' Board will next week be occupied in obtaining at mass Wages' Board will next week be occupied in obtaining at mass
meetings the views of the ironworkers as to a fresh wages'agreement meetings the views of the ironworkers as ta a fresh wages agreement
to supplant that now existing, which is under notio to expire at
the end of the present month. At present they are uncertain whether to retain the sliding scale system or not, , but intimate that if they do so they would like several alterations, the chief of which
is that the selling price upon which waes are calculated
quarterly shall be drawn not as now from the sales of quarterly shall be drawn not as now from the sales of
phiddled bars of twelve firms, but as in the North of England,
from the sales of all descriptions of iron sold by such from He setes or all descriptions of iron sold by such
firms. By geting sheets and boiler plates in, the men expect
to raise the average price. The difference, however, would to raise the average price. The diffierence, however, would
probably not be marked. There are not a few masters, indeed,
who express the belief that the men would be not better off but Who eco. Compared with the North of England wages, those of the
wronsworkers in this district can scarcely be complained of. If no
in fresh arrangement is agreed to before the end of this month, the arbitrator, Alderman Avery, of Birmingham, will decide how
wages shall run pending such arrangements. It any case there is wages shall run penniing ser
The new line of the Halesowen and Northfield Railway Company
was opened for traffic on Monday. It is about seven miles long, and there are two stations, one being at Rubery and the other at
Hunnington. The Midland and Great Western Railway Companies work the line, but the Halesowen Company, who launched the scheme, will participate in the receipts. The line affords increased
facilities for export of minerals and metal wares to the North. The periodical visitation of the operatives engaged in the nai and chain trades of Staffordshire and Worcestershire to the hop-
pioking gardens of Kent is now taking place, and large numbers picking gardens
have already left.

## NOTES FROM LANCASHIRE.

Manchester:-A want of confidence in the future appears to be hand.to-mouth level. Poing and ininishend iran makers continue gene-
hally well employed, the former to a large extent on old contracts nd the latter on orders for prompt deliverry, and prices generally perteadily maintained; but there is very little dt.
The Manchesteriron market on Tuusday was again exceedingly
uiet, so far as the weight of actual business doing was concerned quiet, so far as the weight of actual business doing was concerned byers of any importance it is only with offers at under curren rates. The leading makers do not at present entertain proffered
business at under their quoted rates; but some of the inferior brands of district iron are in the marketat low fifures. Lancashire
ig iron makers who have still fairly large deliveries to work off pig iron makers who have still fairly large deliveries to work off L5s. 6 d ., less $2 \frac{1}{2}$ per cent. for forge and foundry qualities, delivered
equal to Manconeter ; but at these figurest they are doing only a bout 44 s . 10d. to 45 s . 10 d ., less $2 \frac{1}{2}$ per cent. for good forge and oundry qualities of Lincolnshire, delivered into this district. In hematites there is still only the most limited business being
done; nominally prices are unaltered, but if the market were to the favour of buyers.
Finished iron makers are fairly busy with deliveries against
specifications, and, if anything, there is a pressure of present busispecifications, and, if anything, there is a pressure of present busi prompt orders. This, in fact, has in one case been carried to the ixtent of putting an advance of $2 \mathrm{s}$. . 6 d . per ton upon the quote
list rates for bars. It cannot, however, be said that any advanc in prices is obtainable. Makers, where they have to get orders,
are not able to do more than maintain late rates, and for delivery are not able to do more than maint ain late rates, and for delivery
into the Manchester district the average selling pricesa are about \&8 7s. 6 d . per ton for sheets, with no great disposition on the part of buyers to purchase forward at these figures. In heave builders
Ironfounders report business to be very dull. In heavy work, apart from a few special orders distributed here and there ow prices are quoted, cast iron columns and pillars being obtain able at about $£ 6$ to $£ 65 \mathrm{~s}$. per ton delivered into the Manchester
district, and I hear of orders being taken at even lower prices than these.
Pipe castings, which come largely into this district from Soot land, are exceedingly low in price, and they can be bought readily
at E4 12s. 6d. per ton delivered here, whilst buyers for shipment at Glasgow have had quotations at as low as $£ 45 \mathrm{~s}$. per ton, f.o. f .
In the engin. In the engineering trades prospects for the future oontinue any
thing but satisfacotory. There is a good
the deal of works still in hand in the cistrict, but orders are being worked off without being replaceed,
and in the toll-making branch, in which activity so far has been
very well maintained I hear that there is no great weight of ne work coming f
The nut an
The nut and bold-making, trade is getting very quiet, and this
may be taken as a further indication of decreasing activity amongst may be taken as a further indication of decreasing activity amongst
engineers. TT. secure orders
works are pre prices have to be quoted, and view of the depression in this branch of trade, there is a down ward movement in wages, and in some coses notices have been
served upon the men to the effect that the advance of five per cent., which was conceded about twelve months back, will now b taken. Notices to this effect in some cases expire this week, an
it remains to ob seen what action the men will take. Engineers, whors of the Association of hunicipal and Sanitary immediate neighbourhood for several years past, on Saturday paid
a visit to Bury, where they inspected the various public works in
the above town, including the tramways and the new gasworks
which have not yet been thoroughly completed. With reference to the tramways a paper was read by Mr. R. Vawser, the hon.
district secretary of the Association, who said that the steam tram way system was very similar in practice to the railway system,
and that when the depót in the Wylde was completed it would be the largest in existence. At the gasworks the members had an opportunity of inspecting the mechanical arrangements which have drawing the retorts, and a novel piee of mechanism which has been adopted in the shape of a cool breaker and elevator. This consists of a powerful arrangement of rollers provided with strong
spikes or teeth to break up the coal, which after passing the rollers spikes or teeth to break up the coan, which after passing the roilers
falls into a pit, and is lifted by an endless band of buckets to feed hoppers elevated on each side of the retort bench. From these travelling hoppers on a trolly are filled with the charges for the
retorts, to which it is transferred by a continued mechanical arrangement. Papers were also read by Mr. J. Cartwright, the borough engineer, and Mr. Councillor Tuke, of Bury, with reference to the publio sanitary works of the town, in which Mr. Tuke
advocated the ash-pit and water-closet system, and pointed out
ado that if excreta could be removed during the day instead of at nigh as at present, ir woule.
borough of Bury alone.
The advanco in the price of coal at the commencement of the month has tended somewhat to check the demand, and so far as maintained. There is, however, generally a steady trade doing in all classes of round coal, and pits are kept running about ful
time. Engine fuel continues bad to sell, and slack is rather a drug Quoted prices at the pit mouth remain about as under :- Best coal
 Snipping keeps fairly active, but
Barrow.-I can hear of no change in the aspect of the hematite pig iron trade. The quiet tone previously noticed in connection with this trade is still maintained in all departments. The
demand both on home and foreign accounts shows no indication of further improvement. The orders at present coming to hand are not sufficient to lessen the heavy stocks which are now held at the works. I hear confidently that in consequence of this the outpu of the furnaces will have to be reduced. Quotations are lower than
they have been for some time past, No. 1 Bessemer selling at 49s. 6 d hey have been for some time past, No. 1 Bessemer selling at 4ss. No.
No. 2 at 48 s . 6 d ., and No. 3 at 47 s . 6 d . per ton net at works. No. trade is fairly employed, but the orders coming to hand are not con siderable. Prices remain at from $£ 410 \mathrm{~s}$. to $£ 5$ for the usual heavy sells at from 9s. to 11s. per ton at mines. Stocks still remain very arge, and it is impossible to lower the prices to increase the sales, builders have very little work on hand. of orders are coming in but slowly, and the prospect for the coming winter is anything but
leasing. Coal and coke steady. Shipping very quiet, as the seas pleasing. Coal and
is coming to a close

## THE SHEFFIELD DISTRICT.

Minves' demonstrations are beginning to attract a good deal these meetings has as yet been held in the Derbyshire district, but severything in Derbyshire coalfields reacts on Yorkshire, and the neetings have been addressed by the representatives of the South
Yorkshire Association, $i t$ is pretty clear that Sheffield, Barnsley, nd Rotherham will soon be called upon to agitate in conjunctio with Derbyshire. At Ilkeston, on Saturday, a resolution wa collieries in Derbyshire who compelled their men to use the safet amp without remuneration ; the resolution further pointed out the in ocessity for the miners of derbyshire to jevils," and recommend hat advantage should be taken of the improving state of the coal Hiners' Ascease wages. Mr. B. Pickard, of thi tion he announced authoritatively to that although they got 10 per cent. last autumn, they intended to try for 20 per cent. this year. Mr.
Pickard is also found arrayed on the side of those who oppose th Pickard is also found arrayed the objections to it thus: "It in difficult to win the coal through the poor light it gave whilst it led managers to be more lax in the ventila
tion of the mines." One miner went the length of saying down one where the safety lamp was used. Resolutions were also passed in favour of the Employers' Liability Act, 1880, and of the meeting to regulate the output, so as to ensure the supply bein more in proportion to the demand. Another demonstration took.
place at Chesterfield on Monday, when Mr. C. Bradlaugh, M.P., Messrs. Robert Sorby and Sons, the well-known manufacturer of steel, edge-tools, saws, sheep-shears, \&o., are sending a remarkExhibition, which opens on the tht of December.
$s$ presented by isual treat given by the Master-Cutler to his employes after the Cutlers' feast.

## THE NORTH OF ENGLAND

Bur little business was done at the Cleveland iron market hel at Middlesbrough on Tuesday last, and prices were somewhat mor
favourable to buyers than on the previous Tuesday. The deman for No. 3, g.m.b., for early delivery is still greater than the supply but prices do not improve notwithstanding. The small lots of this
grade which are in merchants' hands are being offered at 39s. per ton ut the few makers who have any to dispose of will not sell at les than 39s. 6 d. per ton. Buyers offer 38 . 8 . 6 . per ton for No. 3 for
November and December delivery; but in the present state of the market sellers are reluctant to undertake orders for
forward delivery. Holders of warrants are more eager to sell than they were, and ask 39s. per ton
The stock of Clew
rough stores on Monday pist was 71 in Messrs, Connal's Middles 10 tons for the week.
The pig iron exports for September have so far been excellent. 31,567 tons. Last month in the same period only 23,001 ton were sent away, and in September, 1882 , the e figures were
2o, 787 tons. In the manuactured iron trade there are no signs
of improvement, and what little business is being done is for prompt delivery and at the old rates
The outlook for the winter is not promising, and buyers are not
disposed to anticipate events. For prompt delivery ship plates are disposed to anticipate events. For prompt delivery ship plates ar

 The shipbuilding trate free on on trucks at makers' on the Tyne ans. the Wear
at present, all the firms being fully employed. At some yards on at present, all the firms being fully employed. At some yards on
the Wear the work is being retarded for want of the engines, and
and will have to be put on short time. great anxiety to his relatives and friends. During the last few days, however, the accounts have been considerably improved, and
it is hoped he is now fairly on the road to recovery. It is under-
stood that he will take no part in the approaching meeting of the Iron and steel Institute.
nd Co., certain furnaces, belonging to Messrs. Jones, Dunning will be restrarted next week. It will be remembered they were damped down a few weeks since, owing to certain unreasonable
demands made by the workmen, and it was then decided to commence the alterations, and stop till they were finished.

## NOTES FROM SCOTLAND

THE Glasgow pig iron market has again been exceedingly dul warrants, which have touched the lowest point since May, 1881 The quotations of warrants have been gradually declining fo months, and holders are naturally much discouraged at their con to sell either a portion or the whole of their iron that prices hav further declined this week. The current shipments are good the past week, having been 12,844 as compared with 10,629 in the corresponding week of 1882. But the orders at present being received are not up to the mark, and it is feared that in coming
weeks the shipments will become unsatisfactory. Stocks in veeks the shipments will become unsatisfactory. stocks Connal
week.
Business was done in the warrant market on Friday morning at
46s. 5 d d, , 46 s . 6 d d., and 46 s . 5 d . cash, and 46 s . 7 dd., 46 s . 8d dd, and
 4s. 3d. cash, and 46s. 7 d . to 46 si . 5 d d . one month. On Monday
morning transactions took place at 46 s . 3d. to 46 s . 2 d d . cash, and 46s. 5d d. to 46s. 4td. and 46s. 6 d . one month, there being business
t 46s. 3d. cash in the afternoon. On Tuesday the market wa
 78. 7d. one month

It has been more difficult than usual to dispose of the maker ron, the prices of which are as follow:-Gartsherrie f.o.b. at Glas

 and 45s. 9d. ; Quarter, 47s. 3d. and 45s. 3d. ; Govan, at
Broomielaw, 47s. 9d. and 45s. 9 d ; Shotts, at Leith, 58s. 6d. and
 The malleable iron department of the trade is still very busy with orders of considerable importance pressing for fulfilment rices are not materially changed. The prospect is not regarde as quite so cheering as it was a short time ago, thi
coaccity of fresh orders in the shipbuilding trade.
In the several districts. of Lanarkshire the coal trade is active, nquiry for coals for domestic consumption. The f.o. b. prices ar or main coal 7s. 3d. to 7s. 9d.; ;ell, 8s. to 8s. 6d.; Hamilton ell, At the pitts the prices are less by the amount paid for transit. In nd good prices are paid. The week's exports of coal at Grange-
and
outh have amounted to 7611 tons, and fair shipments were als nade at Bo'ness and Grangemouth. In Fife and Clackmannan th rade is manifestly in a healthy state, and very good prices are exhibits considerable improvement, the orders for house coal becoming more numerous and the price somewhat firmer. Com
laints are made that from the Fife ports freights are extremely ow, this being a natural conseque
The question of the miners' wages is receiving rather more attention. The meetings that have lately been held have bee o whether they will succeed in obtaining the desired advance o 6d. a day, there appears to be considerable doubt. It is much
against them that, while the prices of coal have certainly advanced for shipment, owing to the recent pressing demand, the coalmaster have not as yet succeeded in raising the prices for inland consump tion in Lanarkshire to any material extent. The iroumasters ar re not able to pay, owing to the increased cost of production an their employers, and solicite an increa collieries stating that the advance cannot be conceded at present but may be giv
are expected.

## WALES AND ADJOINING COUNTIES.

## From aur oun Cormandent)

A grave difficulty awaits arrangement at the hands of the iron masters sf foreseen when the sliding scale was established, butcould not be avoided. It is this. The coal trade is very brisk. Wales sending away by sea from the various ports a quantity closely
amounting to 250,000 tons per week, and the price of late is such s to justify a small advance at the next audit, so it is thought hame , time as the ironw, the colliers will have an a acenoe are tuc tion, and the anomaly will be seen of the same employer deduct ing from one class of his workmen 5 or 10 per cent, and giving to
inother at something like the same ratio. That trade another at something like the same ratio. That trade justifies this is patent. Ironmasters have been obliged to reduce prices
considerably in order to sell, and lower wages are imperative to get anything like a modest remuneration. But workmen may grumble -I fear will grumble-unless this is thoroughly explained. The notices issued by the ironworks is now general, and at some there has beim so an old apothegm, and it may now by many an enigma, so runs an old apothegm, and it may now by
improving trade towards st end of the month, and thus enable ironmasters to withdraw the notice. Rails are low, sliding too near four guineas to be acceptabile. Foresign ores are low aiso, an
sales effected moderate. In coal there is, as h have stated, a good deal of briskness, Newport and Swansea being quite up to the deal is done. Small coal continues in demand, and several ironworks which have large collieries are yet under the necessity of buying large quantities of sma
continue stiff for all varieties.
A novelty has been started at Newport, Mon., in the form of a
machinery sale. The first took place this week, when over 200 lots were disposed of. Buyers mustered from a wide distriet, and fair prices were obtained. I hear it is to be an annual occurrence.
There are signs of discontent amongst colliery engineers, and a society has been formed by them. Their grievance is that they
work twelve hours daily, six days per week, and get but 3s, 11d.
daily. The general trades of Swansea are in a healthy condition. Coal and patent fuel show an increase
last year, and tin-plate is firmer.
At Lydney-on-Severn tin-plate works there is a wages dispute
The air is full of rumours with regard to the next movement on the part of the Barry Dook promoters, and the latest is that an and Cardiff, Barry being abandoned to its legitimate owners, the

## THE PATENT JOURNAL.

 Condensed from the Jourral of the Commissioners P* It has come to our rotice that some applicatits of thePatetht-otice sales Department, for Pateot Specifceations




## Applications for Letters Patent.

 * When patents have been "communicated." thename and address of the communicating party are
printed in italics. 4247. TeL EPHoNe Tr ${ }^{\text {4th September, } 1883 .}$

 4249. Harr Cooibs, , B. Borck, Liverpool. 4251. GLUCose, B. Moiske, Germany.
4252. SLuNALLING APPARATUs, W. F.
 Cook, Brighton.
4254. ORNAMENTING Metaluio Tubes, J. Earle and $G$.
 J. U. Burt, London.
4256. Router Mist, H. J. Haddan.-(W. H. Uhland


 Company, Nein York, $\begin{aligned} & \text { U.s.). } \\ & \text { 4261. Hok, B. S. Harrison, Dronfeld. }\end{aligned}$

## 5th September, 1883.

4262. Bnarna Cortrox, C. J. Ash.-(A. B. Cummins,
Tuticorin, India.)

 266. Row Rerrs for Preprarisg, \&̌., Corton, J. T.
Chad wick, Salford, and J. Crossloy, Bury.

 Dade, London.
4263. UMRRELLA, T. Wrench, Lancaster.
4264. REMovina Dirt, \&o, from RALIS, Liverpool.


London.
4265. ELECrTitaL S. Swrichess, H. H. Lake.-(C. W.
Holden, Booston, $V . S$ )
 4278. Fratrive Har Bodres, G. Atherton.一(G. Yule,
Nevark, Newo Jersey, U.S.) 6th September, 1883.
 and F . Cherry, L. London.
 4284. Gass-BURNERRS, , F. Fletcher, Warrington.
4266. KILNs, W. Lawrence, London.

Masaschilusetts, V.S.).



 4295. StoNaL INDICATor APPARATvs,
London.
 Tth September, 1883.
4267. TELEPRHoNIO APPARATUSB, E. George, F. A. Pocoock,
J. S. Muir, and J. S. Muir, Jun., London.
 4300. Furnirurg Castors, A. Skinner and F. J.
Rumney, Manchester.


 4300., TRRADLE MED Mrohanism of Sewing Machines, J.
Pasfield, Sedgley.





$$
\text { 8th September, } 1883 .
$$








 4330. BEATING CARPETS, S. Child, Brighton.




Inventions Protected for Six Months on
Deposit of Complete Specifications.


 tember, 1883 ,
300. Lubricativg the Cyunders of Atr, ec. Evoings


Patents on which the stamp. Duty of 250 3616. Analananators, P. B. Wilson, Baltimore, U.S.-
6th September. 1888 , 3629. Aepmomber. PLAstes, J. D. Ellis, Sheffield.-7th Sep.
tenber, 1880. 3780. Roses of Door Ksoss, ©e.. F. R. Meeson and J.
T. Hopkinson, London. $-17 t h$ Sentember, 1880 . C. Kirk, Glasgow. -6th september, 1880,





 Dundee.-9th september, 1880 . Hart, London.- 11 th
370. Lociss and LATorks, J. M. September, 1880 .
374e. TMers.
tember, 1880., E. Ludlow, Birmingham. -14 th Sep.




Patents on which the Stamp Duty of $\mathbf{\&} \mathbf{~ h a s ~ b e e n ~ p a i d . ~}$ 3604. Pristinge, dec., Maching, w. R. Lake, London.-
14th September, 18i6.




Notices of Intention to to Proceed with (Last day for fling opposition, 28th September, 1883.) 2199. Making Cmisents, T. Smith, Sunbury.-1st May, 200. Indroating Divergexveg of Magnetised Nembless,
G. C. Cooke, Sutton. -1 st May, 1883 . 2225. Weaving Carpers, E. Crossley and R. Cochrane,
Halifax.
 munication from T. C. Robinson and E. B. Welch.-
2nd May, 8 B8.





 2272. COssTruccrisa Lifreboats, \&e., J. R. Hodgson,
Poplar. 4 th May, 1883 .
2288 .

 2319. SpindLes, 风c, D. Skeoch, Stewarton.- $-8 t h$. May, 2388. ELeqrrac Tranwass, H. H. Lake, London.-A
communiation from C. Basto.- - th $M$ May, 188s.










(Last day for fling opposition, 2nd october, 1883.) 2288. Bortus Stanss, J. B. Walker, Sheffield. -5 th
May, 188.

 231. REGULATIMG FLow of GAss, G. P. Lempriere, Bal
2all Heath. 7 th Mayy, 1883.
2315. 231. Exathikintig CAsT IRos, G. J. Rhodes, Wolver-hampton-- 7 th May, 1883 ,
2377. Embrion
don


 ${ }^{\text {2343. P4acking for Pipe Joints, E. Marechal, London }}$


2357. Locomorives, M. Benson, London.-A communi-
23ation from O. Rothrook.-9th May, 1883 .
 29th May, 1883 . Ivensent Elecrric Lasprs, J. Warner, White-













 2986. Thuss, J. C. Cox, London.-15th June, 1883.
3234. Gas Bukirss, H. H. Lake, London, -A comm








 from A. E. and
Tht Au Aust, 1883
 ham - Rirying Gases, Wr. s. Sutherland, Birming.



## Patents Sealed.

(List of Letters Patetht whitch passed the Great seal on the ${ }_{9}^{987}$ 1883 TrP VANs, do., E. Burton, London.- 23 rd Februar
 1078. Elastruc Wiri Basps, F. Wirth, Germany.-27th February, 1883.
125. BLE
1883 . TIEs,
dec., E. Hale, Liverpool.-8th March 1258. Electrioal Stanaluing, w. J. Brewer, London

 1281. Loarch, 1888. . Hodgson, Bradford.-10th March, ${ }^{1283}$ March, 188ss. 124. H.ockss for Fork, L. Blackburn, Peckham, and
 1288 . 1299. Classe for CIaARs, \&e.. F. MacD. Rober 1301. Cost Mrtar
$12 t h$ March, 1888 . Sockerss, R. Clayton, Deepfields, 1302. Fasrehvisos for Doors, R. Whiston, Wolverhamp.






 141. Marchan Issir IsTRMENTs, P. M. Justice, London.-
19th March, 1888 .

 1488. .archirbe Drains, A. M. Clark, London.- 21 st


1526. C Crbecrisg FAREs, T. A. Silverwood, Brighton,-


 1571. Firg-aniss, de., H. Pieper, Belgium.- $28 t h ~$
March 1883









 June, 1883.
3412. 188 RED PLATEs, W. R. Lake, London. $-10 t h \mathrm{~J}$ Jly,
188,

 1999. STrimy 11889.


 3509. EMbisporiserxixa Machinss, R. H. Brandon, Paris.
 (List of Letters Patent worich passed the Great Seal on the
11ti September, 1883.) ${ }^{\text {426. Priskrviriga Mrik, E. A. Brydges, Upton.- } 26 t h}$ 1273. Ahstrensises for Scarves, E. Hewitt, London.-
9th March, 18ss.


 1335. Gentariveal Sbarating Machings, F. H. F.





 ${ }_{1379} 153$. Emeryy Whert, T. West, London. -15 th March,

 132. SAck Llerters, T, and A. Lewis, Kettering. -15 th

 1426. Domessrho
March, 1883 .

 1459. Metalilo Foor Warners, T. H. Ash, Birming-
ham.- $-20 t h$ March 1883

 1588. Lock Norss, E. and A. E. Gilbert, Dundee. -27 th
 1617. Eucriric Lasips, W. R. Lake, London.- 30 th

 List of Speciflcations published during the
week ending September 8th, 1883 .

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## ABSTRAOTS OF SPEOIFIOATIONS.

repared by ourselves expresshy for Tha Exariver at the
ofice of Her Majesty's Commissioners of Patent.
 Throcedede with.) $2 d$. opquae sereens in ascertaining or ormparing the inten-
sity of of lights, such sereons being formed of two
Sembers attached to nembers attached to one another at any desired
ngle, the double screens so formed resembling wedres
 aarried on a bracket on the barr, and is directed on to
 able on the bar, on to the proper face of the screen 6073. Stoppers for Aerated Water and other
Bottles Containing Liquids or Fluids under
 This relates to a stopper which will sink in the
quid contained in the bottle, and which is made of five parts tale, three parts manganese, throe parts
shellac, one part aspante powder, and one part
amber, the o amber, the whole being heated and m.
and then moulded to the required form.


 near the wann the rod are tastened two cotters, one
net and the other a certain idstance
from it, nand between them is A second rod connects the block with a crank to to
which one side of a hook is fastened, and above the crank is a bent plate took his fastened, and above the hook is hinged and
which is held in position by the ordinaty hook and

 at either sidido of the wagon) to ho hook is disengaged.
6174. Door Locks, $W$. Morgan-Broun, London.-
 Thisis.) ralates the the use of a special locker arm for












 min oum numbero fot





6240. Indicating and Reoording the Pressure and
Direction of the Wind, L. M. Casella, Hamp-








 Ron Boom wos suow


 toin paesiog our tho loitare
23. Breech-Loading Fowling-pieces and Fire-arms,
H. W. Holland and J. Robertson, London. -1 st Janu-





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 and


 machines with vertical needie bars is also described.
45. MACHINERY For Cutive AND RENDING Wood
INTO S.ZEs SUITABLE FOR FIREWOOD, EC., $T$.



















 69. Apparatus to be Used in Welding Boiler and
other Shelle or Cylindrical and other Forms, Iniluaghisy














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 74




















































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This onditstin ind idigg ginh rollers. moro durb)








80.1




 ald cond



































 This ondiditis in momereringsulphur fom alkal wato



 101. Ampuc














 parta in the






 This ratates topparata for reghathay tho apply









 nar, and tho outher for supplyig oul



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 own metallic lead.

Thise ratest tomang tor autug g pphof turuw wito











 Thidi ralates to vale it in which conicalor or other


























 shap. Po






 spoles of tha mmatard to pass sicceasively through






















 darm.



oha January. 1 188.









 ${ }^{\text {alear. }}$

Mechanism for Obtaining Step-by-step Rotary 1883.- (A communication from A. A. Kaiser, Berrin.)
6d.

An toothed wheol gars with a whel having eqtither a



132. GAs Evarwe





 contact under exceasive speed






 in thed gis. Instand of theam, water in the torm







 anlee










 40. Cossrrverrox or Boin res, , M. H. smith. Halifax:

 141. Woourusy Fannase do., B. Joephh, Lecds,-10in


 The object ind ow, wathe oly and other simila sub-




## 


















 hradad so that the
fa ting gle fabric.



adale whice then movee under a main sido when the





 ndig than tubble ond a main or driving whe









 Tho subtanco to bo traeted is first admittod to a
 The water in the orm orme item Whan sumfieiently


 154. Oc ramins in the vessel.
 Tith prinaipal bijeat tig to enable onnibuses to run of gravity, the thenteels beefing and ampayeding to the oentre






 This root procesestad to the repeoverry of ammonia from various
 spray, and also to apparatus for effocting such opera


 make notches in its sideo, to whito ememy or sand and 158 cutrough the same.


 This ralates to the "tappot motion" which actuate
 poggectsoeng top pivo preater facility for seating the



 This realeses to apparatus for efrecting tho orimping






 At thbe if supplided with reerairy from an outer tube






 with a roler dirven at the eme surface speed, and din
 164



 Tha dough is drawn out between bars or toeth
arranged on two parallel dibes turnming in opposito








 Reif roar endes, and through whid fang fore air
 impurt








 This ralatese to mann, for hating, regulating, and














Thisi ralates to machines for making candiles with
















 verry one carrying h horizontal rod at top placeoc beforore
 178: Appraftrs por Lubrioutisa Stram Cytrindres,















 motallic ends saled din 181.






 183. Eit











 186. Preventina the Entry of Water into the Air













 or rivest, and which woom torm the the of of the esheaseses.










 bottom to the coorr, and each having on its edge next
the spind od a deop groone extending from tho bottoum
through the cover, ndd terminating in outwards to throw any liquid leaving it into a firived
recever surrounding the ilip. At bottom the grove is
deepened until the bottom of each reaches to the out
 on tending up some distance, and preferably of $U$ sec
exten
tion, the tion, the chananel extending, thro phat the bottom of the
drum, othe the liquid leaving by them will pass to a
fxed receiver below
 The object is to render button and lace holes less
liablo to be burst away by the strain of the buttons and laces, and consists in securing a string or cord
round the edge of such holes.
195 .

 from, without injury to the aroma, the fatty, waxy
and resinous sunstances contained therein, and it con
tist
 acting fuids to separate the substances containing the
wax and fat, and the remainder poured back over the
tobacen

 crushing hedd tapering towards its upper end and o
circular section.
The eshaft is caused to revolve, the lower bearing revolving with
it, and being arranged so as to give an excentric
198. Exchiva or RoLlers, c. J. Appleton, salford,
and D. Appleton, Manchester:- $-12 t h$ January, 1883.

The etching in efffected it by the aid of electric or
mago tion urrents and it consists in making the
roller the anode of a battery, the current passing from

 protecting varrish will be acted upon by the
and the required deesign etcthed upon the roller
199. Worksaskrrs, de., J. Johnson and B. Renaudin,
London. $-12 t h$ January, 1883 . (Not proceeded vith.)

Thid consists in combining with cane, wicker, straw
and cotton or hemp string cord or string made of
extic hemp, as aloe, alpha Mexico, and manilia hempe exotic hemp, as alo, alpha Mexico, and manilla hempes
China grask and other plants of the mame fammy
which are made into string or cord and dyed, and have the appearance of silk.


 centage of manganosese vary iron or metata or steen a per
cotween per cent.
20 pror cent. according to requirements, wherebby the
processes of tomporing, rolling forg ing, nd hard
are dispongeng
dith, quality, greater commercial value and at less cost thay 201. Coxpouxd STEAM Esoorses, J. R. Wells, New
 hith.-prossure cyindirer, and then through a jacket
surrounding the lattor to the low-prossure cylinder.
The pistons move in
 boxes in the low-pressure cylinder below, and in its
piston, and is connected by a crosshoad and rod to single crank. The low-pressure piston hand two rods
each connected by an independent crosshoad and rod to a separate crank on either side of the former single
cranks, which is diametricilly opposite the other tovo cranke, white is diametrically opposite the other two.
Piston valves are used for distributing and oxhausting
the steam, and they are arranged so as to be worketh

别 wer die with its upper and outer patt tapering, and the upper dio with a recess in its under side to to fit one over
the tapering part o the former, the "snap" or cup
being tormed tin the the 203. IRos Havin-RaII STraxcorons, W. Rocklifé, Sun This consists in taking iron direet from the furnace
to rolls soosstructed with grooves in the proper pos tions to form the bulbs on the stanchion papid of the
proper shapes to roll the stanchion to proper shapes to roll the stanchion to the required
taper, the ioroumferenco of ench roll being the length
of a atanchion.


This relates to means for jointing together tubes to
form postz, and it consists in making the upper end o

 206. Loto Jorive EEvinss, R. R. Fairlie, Westminster. This relates to locomotives of the Fairlie type, and
consists, instood of carrying the steam pipo throukh
 reduce the cost of tsteam pipes. The tender wheels
engle
 which it is exhauster into tanks and condensed. The
bogie eentre is of gratatly emlarged diammetrer to steady space extend across the fire-box.
207. Dres
 strip
strip or bernd of linen or other placed over the mouth of the bothle and driven in sides of the bottle in any suitable way. The To withdraw
the eork the the send of the elinen
 wax.
208,
this.
This
colour, and it consists in forming guch boxes with a
strip of motal having turne-up euges with parts cut away, so that the turned.-up parts will have a spring
action, and friml seouro pans placed between them
no one side of the bot, by which means no crose
 trips beewwen the pans are
the adjacent pans may touch.
212. Lerting Down Carriage Windows, G. T. Chect.
ham, Brad ford.- 13 th January, 1883 , $6 d$. The object is to enable the opener of the landau carriage door, either rrom the insia or outside or the
carriage, to lower the window to the oame instant,
and thus prevent the breaking of the glass and the trouble of putting the window down when the person
inside desires to get out, and it consists in a suitable insie desires to get ourt, aconnectensists in a suitable
arran geolth the French
lam lock of the carriage doon.
 $1883.4 d$.
Upon the meeting rail of the lower sash is a short
Ube. and upon the meeting rail of the top sash is a
 so as to bo capable of turning therein, and having at
its inner end a tooth, which enters a groove in the its inner end a tooth, whice enters a groove in the
tubo on the other rain the rane nd of which isiniclined
so that when the boit is turned - after the tooth has passed through the latter tube-the tooth is causer to
travel up the incline and so pall the meting rais
frmly together, and at the same time securely fasten. ing them
214. Hor-anR Exarsss, H. H. Lare, London. - 13 th
 sewing and otior sman machines, and it consitsta
partly in proving the colinder of the engine at a
point betwen the extreme postion ocupied by the point between the extreme positions occupped by the
pisto, with means
whereby
at cortain moments


 This rolatese tor otany pumps and ed egine, especially
applicable for drawing or forcing air. The cylinder A

 radial distanco between the e entre of axis D and that
of the crank opin biing somewhat less that the radius
of fuch oircle, and the extreme point of the inward Send of the cardioid curve is also cut off so that the
piston may have sufficient thickness at the centre. The piston may have sumucient thickness at the centre. The
enda of the piston fit the onds of the caing and its
edge furthest from the inward bend of the casing

[16


The other end of the crank pin passes through diso
I, concentric with the crank and free to revolve in $a$ I, concentric with the crank and free eto revolve fna
reeess at the opposite end of the oasing
A tubular heck projects from the piston and aloo passes through
disc $H$, and carries rods I , with projections at their


 of the bar N .

This relates to an improvement on patent No. 1823,
A. D. 1876, and consists in applying thereto a doublesap lock which cannot accidentally become un.
astened. The two ends of pipe are drawn together by fastenings formoed partly pby segmental raw ribs at the the
ond of one pipe, and sefmental recesses in a union
 irawing up the two parts, between which india-rubber
is inserted. Behin the wedge end of the rib is a first
Sock shoulder which 1ook shoulder which slips over the first projection,
makking arrot lock $1 t$ tis then further twisted until
it it comes in contact with a second projection near the
centre of the segmental ribs, such projection again coming in contact with a recess cut in thee projection,
and entering therein forms a double-lock joint. 232. Canbosarto or Srrowrti, D. Urquhart, West This relates to the manufacture of carbonate of ng to one mothod the sulphate is ground to a fine the manuacture of carbonate of soda by oth othened in
process, and which podas, and some sulphite, and by it the sulphate of strontia is decomposed and carbonate of strontia and
cuastio strontia are formed, and sulphate of soda. The preciptated carbonate of strontia is washod to remove
the soan salts and dried The wash hliuours and the
frst first liquor are treated with carbonic acid to recorer the
cuastio strontia which is is in ollution, and they are then reporated own and sulphate of sodat obtained
thimed
wy thother method the sulphate of strontia is mixed with black ash and carbonaceous substances
and the mixture rosted, and by a third method
 alkaline carbonate.
 The appratus employed consists of a vertical water $t o$ meet a descending stream of particles to be sepa-
rated, the heavier particles descending and being col rated, the heavier partices descenang and thing col-
eoated at the bortom of the tube, while the lighter
nartied



 by cutting and taririn, and so that the material is
conducted automatically by the tool out of the hole

bored, such hole heing large enough to allow full play
to the rear part of the tool in proportion to its advance o the rarar parto of the tool in in proportion to otita advance.
The drawing shows the general construction of the 312. Type Writers, dec. J. J. Rageth, Aston, near As anpliiod to. - llabel type writer, the invention con-
ists in in ixing the then rubber, in a row or rows on the rim of a cylindrical
wheel which rotates on an axis near the end of a lever capable of motion in a vertical plane. The joint on
 is underside enggaing with and capable of traversing
in one of so series of paralel grooves in a stationary
 ypes are inked by a pad, which also a atetas as a shield,
by a roller. The outer face of the paper, and has a slot in it to permit poly one Iotter or
type to come in contact with the same. The type heee has teeth with which engages a astop carried on
he end of spring lever, by deprossing which the wheel can be turned to the required position, and then by
depressing the lever carrying the type wheel the im-
 secive tho next letter, and the operation repeatod.
When the line is finished the movable table is moved Hhen the line is finished the movab.
to the next groove in the fixed table.
327. NexTrua

The machine is worked with a ${ }^{\text {a }}$ double jacquard
action forming meshes and knots similar and in tbe
 rapiatity Mee double jacquard motion employed for
thh distribution of the motive power is ocompose of
two slide boxes partaking of a reciprocating vertical
 vers miich transmit motion to the various parts of
 This relates to vortical coke ovens, and consists,
Firrst in formmna a series of small inclinind flues round
he

 e entire height of the oven and communicating above



 xternal air by small flues which can be regulatedi
and with the combustion chambers by a series of small nues arranged on the entiria perirphery ; and Fourthly,
In arranging on the upper part of coke ovens a second
 ovens through the combustion chambers of an adjacent
oven.



 pieco has
as usual.
493. Windriso Trread upow Spoors or Bobbrys, J. P
Ketr and T. Lavo, Paisley, N.B. -30 th January 1888. $6 d$.
The machine
 and a a back spindide for hared apoing, all in thing sampindio.
Below the spindles are two Below the spiniles are two horizontal rods, to one of
which the winding spindies aro ottached, while the
back sind back spindles are attached to the other, the two rods
having the neeessary movements imparted to them by cams at one end. An adjustable connection is intro-
duced betwen the rod to which the back spindles
dre

 outside the boss and prevent thread winding on the
bonss and tho threa ma be but oloser to the spool
end. To further ensure this the kote

 This.
This consists in malking the satchel of half cylindri-
cal form with a flat bottom, so that the music or orthe papers need not be folded. It may open at tho ends
or bottom. 706. Colovring Matrers Suta ble for Dring and
PRintine, $I$ Levinstein, Manchester. $-9 t h$ February, This relates to a new method of producing sulpho
acids of beta naphtol, and obtainnin red colouring matters by combining theso sulpho acids or their saits
with certain diazo compounds. 10ib. of dry finely powdared beta naphtol is dis tura beloow on deg. Cont The solution is tsirred con con.
stantly for ten or twelve hurrs
 added to neutralise excess of sulphuric aceid and and

precipitate is reparated, when the solution, which is of beta naphtol, is converted into its sodium salt and
combined with certain diazo compounds in the well Enown manner.

 ture, so as to comblne in one apparatus arrangements
for compressing the air and the engine worked by it,

 arr and the igniting flame. The motor cylinder is kept
cool by a water tank. The explosion takes place in the compressing cylinder, and compresses air which .

 The boirerp, pressuranania) ued by means of a cylinder
piston and rod to operate any convenient part of the piston and rod to operate any convenient part of the
pordinary contrifgat governor, with the obbect of
counteracting or assisting the centrifugal force of the

same as the boiler pressure rises or falls. One mode
of effecting this is shown in the drawing. The boiler
 different forms of governo
1245. Govervors,
March. 1883 .
d.

The governing movement set in action by change o on a cylinder and pisten we the the throttle valve but to apply the power required to shift the valva. In one bined with four rallse operatiog by comentriugul 18 cotion
and these parts are directly connected to to the relay cylinder, the valve of which is of hollow cylindrical
form divide Iorm divided inside by a longitudinal diametrical
partition, and it has obtha turnning and alogiturnal
motion motion in a cylindrical chamber. Each compartmen
of the valve has a helical slot in its ite se, and wher the governor acts upon it the vals turns and put
one port in communication with one of the inlet ports one
and the other with the exhaust port. On the pisto the steam
 This relates to spanners with an adjustable jaw and known as chyburn spaners, and it consists in
forming the movabe jaw with anoection oxtending
under the croses bar or slide, and the the of whic rests and slidides against the end of a slot in the solit part of hao spanner. The jaw is actuated by a scrow
with a bearing in the solid part of the spanner, an fitted with a m mille owheel to rotate the serew, the in the projection on the movable jaw.
 (Complete). $4 d$.
lever witha
lo
lon
 a recess, and when the button has been inserted in the the
button:hole the lever is turned over and then drawn
 loop.

 This consists in treating milk for the manufacture ing the same in onecoo. suitable apparatus is deseribee
for effecting this object.

 This conprises a pecial construction of rolls where. the most uniform, rapid, and economical manner, said



 tion, and the trinoiple of the apparatus cons ists in in plane given to a leadng or or oridining bar fixed upon a direction perpendicular: to the motion of the slide rest
 This relates to the general construction of the appa1983. Subtrranaman Electric Cables, H. J. Allison,

 suluating matetrial is in mot diminished except by the
 the next inner series. The same serles in each alternato division of a cable are turned in succession from
tight to loftt and left to right, so that when two divitions are connected the corresponding series are in 2
relation to reverse the magnetic polarity of the currente In each successive division The cabble is enclosed in a
mould and an insulating composition pourred round it


A motal strip is wound outside the cable in the oppo.
site direction to the outer series of wires 2050. Glass Lamp Chimney, P. A. Bayle, Paris., -23 r This consists in forming lamp convergent divergent form to increase the combustion
207O. Roolure Murs, A. J. Boult, London. - 24 th
A pril, 1883.- (A communication from H. J. Gilbert, Tayton, $U$. $S$ ) (Complete) 44 di 1 idding the stock of each sieve to
y , in devices for diusting the fast trolls to and from the slow rolle

 length with a hopper having a channel leading from
the pipe out over the adjacent faces of a pair of rolls cuide the fluff from the sieve through assage, and defiector above to prevent the fluff fying over and in swinging prms, and the slow rollers have stationary bearings. The arms pass through a cross bar of the
frame, and are pivotted upon short shafts that fit round openings in the cross bar. The arms on each
side are connected by lattor carring betwoen jaws
larms an excentric, about which is is itted end of the oye of a
ar screw bolt.t. the shank of which screws into a socket in
the end of a shaft fitted in a housing in the frame, and surrounded by as apring. By turning this shaft
the rolls are adjusted, and the spring allows them to yield when necocsary
 The invention consists. in comprtete) the impuritioe

 in the reservoir by precipititation. In one form of
apparatus a spherval reservor io placed on the boiler
and in the latter a funnel is placed with its botton edge not higher than low-water lovel. A tube con
nects the apex of the funnel with the top of the reser-
vet rotur, and on the onther side of the top of the latter
rown bolo the funnel in the boiler
a bow-oft pipe A blow-off pipe is connected with the bottom of the
reesrovir. A deofeotor dopends from the top of the
reservoir to about the centre.
 This. relates to means for holding the runner of an
 spons of the umb
tion
ment of springs.
2084. Manvene or of Wire Ropr and Machiner

Single wires are first placed around cores to form
ores for the strands, and then single wires are place cores for the strands, and then single wires are placed
around such strand cores to form strands, and lastly the strands are ludid around a main ropeo or core to forry roper the whole being effiected
nachinery in one contin uous operation
 P. Tolman, Massach useets), -(Complete) $6 d$.
This relates to machines for manufacturing cordage. ar fabriss, in which the strazin twist, and in which the travellers carrying the strands
have an intermittent motion, being at times held in Mosition by a t tationarar toothene duidid or ring or travelurer-
holding plate, and at other times removed by carrier
 In the combination with the usual revolving platform aning one or more circuiar reecsess or guade path points adapted to be operated in one direction by the travellers and in the opposite direotion by a spring or
 the revolving platform. The invention further con-
tists in certion idetails of construction
 This consists in a double-edged band knife with its dges inclined at a very acute angle to the centre line of the blade, the suceasive inclines being connected
by short curved or straight edges inclined in the oppo-
 Maceerge, Victoria.). (Complete.) bd.
This relates to a clinometer compass or altazimuth
istrument, and to apparatus for reading its indica tions. Eithere a combinined clinometer and compass is metere is in a a bulb at one ond of a phial and the com.
 or reading off the angles of inclination to the horizon



 The rails are preferably utilised to convey the current
and the engines are provided with armatures of equal and the engines aro provided with armatures of equal
racistance, and by operating with low tension currents of great quantity two or more dynamos moving ypon
the anme track may be operated simultaneously. A



 they bear successively against the insulating surfec
and throw the coile connected therevith ing cessivel into circuit. The rotation of the cylinder is effected
 ssitch cylinder. As the current varies in this magnee
the core is raised or lowered, and the gylinder tarned
to bring
 circuits of the charging machine aro through the field
magnot cores of tho ynamo , by a wire to the colinder
of regulator, and thence too the coils of the charging 2205.

(Complete) $6 d$
This relates to the construction of the armature,
and tot the method of concentrating the magnotic oroe
of the field magnot immediately upon the wires from
which the electricity is to be derived, and it consista
essentially of an armature wound with a series of the layers of which thr placed, in combination with a field magnet, for the purpose of producing a magnetio field by said field
magnet. and concontrating the induced magnetism in
immedio immediate proximity to the wire of the armature.
Various forms of lamps are described for use with the Various forms

 warping of mule cop yarn, because of the liability to njury to the cops durng th axaigh of yarn, turn
from in a line paralle with the axis of the cop, durin the preliminary operation of spooling, and also to beaa
directly from the cops without intermediate spoolit operations. The machine consists in the combination
with a beam, suitable driving mechanism and tension evices of cop supporting spindles on which the copa
 drawing it directly from mule cops, but the tean rawn from them in line at right angles to their axid nd the eops are perminted to revolve back its wa
during the draught of the yan therefrom on oo the beam, and. therefore, the yarn is beamed with
out further twisting and also without intermediate spooling . The spindles must be formed so as to to
dightly bend under the tension of the yarn in order that the cop cann change its position sufficiently to to
tnable the yarn to free itself from any ordinary break, narl, or mat in the co,
2242. CAtchisn Soor from Smore in Chinnvys,
F. C. Glaser Berlin.-2nd Moy, 1883 .-(A communi)
 nd of one reaching down into the chimner. Between the adjacont ends of the tubes a smaller tube is
inserted, and to its lower end an inverted cone reach. ing into the lower tube is sixed. Upon the outer sur-
face of the small tube a conical shield is ixed with its arger edge upwards, and a space between it and the 2255. Rails por tramwa
 Ordinary $T$-rails are formed with projections near on the guard rail. go that when the two are bolted
together a rigid girder will be formed 2290 P

 ight is obtained by the incandescence of a cage formed of threads of magne ia or or orer suitabie refractory,
material heated by means of air and combustible gas,
 by simple air rarassurts, the air being heated by small
iets of combustible gas in the lower part of the lamp burner.

 (Commpunicatiot from P.J. Garin-Moroy, Francen)
This compsists) in constructing supports or bearings
with contractile sockets, preterably made in one piece with contractile osockets, preetrably made in one pliece
with the framer or support. The sockets have openings formed by cutting away part of the metal at at
and means
and hhem, such as boits pasesing through lugg formed on the made to ropip or rob whease the shaft, rod, or other part
tnserted therein.
 The invention is designed to operate in accord with enabing a vessel to be informed of the course of an auproane signals at intervals of time, variously repeated accorcing to the
indicate the tharticular point of the compass at the time represented by such repetitions. The code is on pointer moves over the dial, and is connected to suit-
able mechanism for automatically sounding the signa the required num
intervals of time.
2341. Vulcanisisg and otherwise Treatina Com-
 This relates to apparatus for working vulcanisable
compounds into articles of great lengtb, by vulcanising compound into article

Thid consists esentially in subjecting the interion o
boilers sto the action of an infusion or decoction of
buners to the ation of an infusion or accoction of
euce the purpose of preventing and removin
and

 prepared to receive them.

SELEOTED AMERIOAN PATENTS,
282.251. Boring Brace, Azro H. Adams, Senta Rosa


 the block D, substantalally as deseribed, and for the
purposes set forth. (2) In a boring brace, the crank

B, having the crown wheel C fixed to the lower en
hereot, in combinatton with the block D , havin onening $q$ G samid block being provided with projection
Ds, mounte


forth.

282, 256. Combined Pipe Tongurs And Wrenor Claim.-The combination, with the frame A, having
hook B, eentral vertical core. receesses, and horizontail hook B , central vertical core. recesses, and horizontal
extension $\mathrm{E}, \mathrm{a}$ apring seoured at one end within tho


282356

at its upper end, and the esparable and reveratble bar H a corrugated or roughened surface, and its otber end
having a plane face, of a shape corresponding with having a plane face, of a shape orresponding end
the shape of the inner face of the hook $B$, uubstantl
the ary Blake, Pepperell, Mass. Fited May $285 \mathrm{kth}, 1883$.
Claim- - (1) A belt stud having T-heads, and a bar or


cross-heads, and a bar or shank flatened approxt-
mately at right angles to said heads and bent near its endos, so that said heads lie flat upon the
stantially as described.




described. (2) The combination of the tube A . ar the swivel head c, provided with the insulating lining
F, through which tube and head the electrical con

 Cloim. - The combination, in a reducing valve perated by a foat sustained by mercury or other
fuid, with the chamber contaiving the float, wi

lengths of pipe connected together by swivel-fitiug
enstructed so thit the height of the column can be djusted to balance the desired pressure, as described.

CONTENTS


