clamp fastenings. These sections are built up, one upon another, until the mould-placed vertically in the pitreaches to the surface. This is lined with a thick layer of cement and sand to resist the beat of the melted iron. The cavity in the mould to receive the molten iron is 4 feet 9 inches in diameter at the bottom or breech of the gun, 3 feet 7 inches in diameter at the top or muzzle, and 40 feet long.
The casting is done after the Rodman system-that of cooling from the interior. To illustrate the effect of this, the mass of iron we will suppose to be divided into concentric rings, the iuner one of which cools first and contracts, when the second cools, sbrinking upon and firmly uniting with the first. The third, fourth, and so on then cool in order. The effect of this, as illustrated in very large guns, is great uniformity of the metal and greatly increased strength, owing to the almost total absence of internal strains and because the pressure arising from an explosion is resisted by the circles formed in the shrinking.
In the guns cast after the old method of cooling from the exterior there was always a quantity of idle metal, so to speak, but by this plan eacb ring or circle does its part in withstanding the pressure, and the internal strains are so distributed that no part of the iron is subjected to strains in a direction abnormal to those which it assumed when cool ing.

This cooling from the interior is effected by a bollow core, consisting of a wrought iron tube, about 9 inches in diame ter, covered externally with clay to resist contact with the molten iron, and made perfectly tight at the bottom, but open at the top. This tube forms the bore of the gun when cast. A circulation of cold water is kept up througb the interior, as near as practicable to the hotiron, in order to cool the castiug from the bore outward, that the desired con traction may be toward the center for the purpose already described. As shown in the engraving, two pipes enter the open top of the core, one for the admission of cold water and the other for the exit of the water which has become heated hy its passage through the core. The large drum shown just above the pit is designed to carry off the vapors arising from the castithg.
On July 9 an attempt was made to cast one of these enormous guns. The mould had been made ready, and the furnaces had been going since the day previous. Each of the three furnaces, which are located at a little distance from the pit, as shown in the cut, contained 40 tons of iron. During the melting small rectangular specimens are taken from the furnace and broken, the appearance of the fracture serving as a guide in regard to the quality of the metal, which is carefully brought to the required standard. The difficulty of breaking these mamples, each of which was laid across an opening in a block and struck mand blows with a sledge before it yielded, indicates the great strength of the metal. When everything was in readiness, the furnaces were tapped and the molten iron led to a mixing chamber, from which it flowed to the mould. About an hour after the mould bad been filled the beavy iron flask burst open at the bottom, when the column of melted iron, nearly forty feet bigb and about four feet in diameter, instantly settled to the bottom of the pit and formed acheese 13 feet in diameter and 6 feet thick. As the pit was perfectly tight and dry no explosion took place, but as the mass fell to the bottom it went with such force that a small amount was thrown out to the roof, which, together with the foundry fixtures, was hurned. The damage to the flask, the recovery of the heavy mass from the pit, and putting it in sbape to be remelted, is a serious loss.
Our secoud eugraving shows a gun being moved to the machine shop. The casting is remarkably perfect, no flaws or other imperfections being visible, and even the joints formed by the various sections of the mould being bard to discern. When finished, the gun will be 30 feet long, a portion beiug cut from each end of the casting, 56 incbes in diameter at the breech, and the bore will be 12 inches in diameter. It will be a rifled breech-loader, and the method of operating the breech block will be the "interrupted screw system," erroneously called the French method. It, will be worth $\$ 28,000$-about balf the sum that a steel gun would bave cost-and, it is calculated, will be able to throw a projectile six miles.

## Novel Form of Earth Plates.

A novel form of earth plate, in which a continuous process of depolarization goeson, has been devised by Mr. Justin Halisz, chief electricinn to the Galician railways. In a square bole in the ground, about two meters deep and one meter square, there is placed a bed of coke of moderate thickness. Above this layer there is formed, by aid of a wooden tube, a column of coke six inches square reaching above the ground level, the earth being filled in around the tube. Near the upper part of the column, a few inches above the ground, there is placed a large piece of coke which bas been immersed in molten lead, and to this there is connected a copper rod to which the conductor is attached. By this arrangement, the gas which forms in the soil can esitself, and thus the earth contact is kept from polarization.

Tife Belgian Government bas officially invited all foreign governments to take part in the Universal Exbibition, which will be opened in Antwerp the 2d of May, 1885. The works, which bave made this port one of the finest in the world, will then be completed and inaugurated.

## HBTABLIBHED 1845.

MUNN \& CO., Editors and Proprietors. pUbLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.
o. D. munn.
A. E. BEACH.

## TERMS FOR THE SCIENTIFIC AMERICAN.

ne copy, one year postage included...
ne copy, six months postage included
Clubs.-One extra copy of The Scientifio American wil............... 160 rratis for every cuub of five subscribers at $\$ 3.20$ each; additional copples a Remit pros
Remit by postal order. Address
'rbe Scientiac American Supplement
is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT
is issued weekly. Every number contains 16 octavo pages, uniform in siz with Scienthic american. T'erms of subscription for Sopplemen with a
85.00 a year, pustage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throushout the country
Combined llates. - The ScIENTIFIC
will be sent for one year postage free. on American and Sopplement papers to one address or different addresses as desired. The safest way to remit is by draft, postal order, or rexistered letter.

Scientific American Export Edition. The SCILNTIFIC A MERICAN Export Fdition is a larke and splendid peri-
odical, issued once a month. Each number contains about one hundred
large quarto pages, profusely illustrated. embracing: (1.) Most of the large quarto pages, profusely illustrated. embracing: (1.) Most of the
prateg and pages of the four preceding weekly issues of the Scunctic platee and pages of the four preceding weekly issues of the Scukntific
AMErucan with its sblendid engravings and valuable information: (2. Commercia, trade, and manu facturing announcements of leading houses,
T'erms for Export Edition, 85.00 a year, sent prepaid to any part of the world. Single copies 50 cents. Manufacturers and others wbo desire to seclure foreign trade may have large. and handsomely displayed an The ScIENTIFIC AM MuCAN Export Edit a very moderate cost. tatlon in all commercial places throukhout the world. Address MUNN
CO., 361 Broadway, corner of Franklin street, New York

NEW YORK, SATURDAY, JULY 26, 1884.

## REMOVAT.

The Scientifio American Office is now located at 361 Broadway, cor. Franklin St.


TABLE OF CON'TENTS OF
THE SCIENTIFIC AMERICAN SOPPLEMENT NO. 447,

## For the Week ending July 26, lss4.

 I. BNGN NERINQ AND MECHANCLS. - Improvementsi irtheHar-






## CONGRESS AND THE PATENT OFFICE.

Congress bas made a slight increase in the appropriation for the Patent Office for the year ending June 30, 1885. The Commissioner asked for $\$ 650,000$ on account of salaries for those employed io the department, but was allowed only $\$ 597,170$; this, with the various changes made, will give an actual increase of 52 in the number of employes. It is to be regretted that Congress could not bave been induced to deal more fairly with the inventors of the country. The Patent Office badly needs more room, and its business should bave been confided to a separate and independent department, as was so ably advocated by Senator Platt. But, even if such action was rather crowded over than fairly considered, on account of the nearness of a presidential campaign, there was no good reason for cutting down the appropriation asked for by the Commissioner to increase the orce in the office.
The business of the Patent Office bas been notoriously in arrears for more than a year past. According to a report made by the Commissioner in April, there were at that time over 5,000 cases pending in the different divisions of the office. A large proportion of these were cases which bad not yet received the first inspection of an Examiner, applicants baving to "wait their turn" in a manner but little less tedious than if they were litigants before the Supreme Court. In each one of the twenty-five divisions the Examiners also report an urgent need of more room, as well as of additional belp, it being impossible to keep the records and the data for reference in proper order for expediting the work. The in justice thus done toin ventors is utterly inexcusable, for the re ceipts of the office above its expenses duing 1883 were $\$ 471$, 000 , and the surplus on the 1st of January last was $\$ 2,676$, 476. This is money which the Government bas taken from inventors for the exclusive purpose of paying for the conduct of the business, and it is neitber law nor equity to di vert it from that channel. The inventors bave paid enougb to bave their business not only done well but promptly: and for them to be compelled to wait for months to bave their claims passed upon, from insufficient departmental facilities, is a great injustice. Some improvement may be possible with the increased appropriation for the ensuing year, although the increase is not what it should be, and it is more than likely that it will be overbalanced by the growth of the business of the Patent Office during the next twelve months. Of the many bills iutroduced for the nullification of pa tents uot one of which was passed, it should be particularly remembered that they did not die with the session. The snake is not killed, but was only scotched, by the indignant remonstrances which the proposed legislation elicited. These dangerous bills will remain on the calendar, and in the same position before committees, at the opening of the next session in December, as they were left at the adjournment. It behooves all who are interested, therefore, not to cease in their watchfulness, or in their active efforts for the preventiou of such reckless legislation, while the presen Congress is in existence, or until next March

## DRIVING BY FRICTION.

For many purposes for which gear wheels were formerly used surface friction wheels are now employed. If the surfaces are properly matched as to material, and are sufficiently large as to area, there appears to be no reason why friction wheels cannot he more extensively employed than they have been beretofore. One of the objections bas been that there must be an end thrust, which by its friction absorbs much of the power. It is a baseless objection, as may be seen in the friction clutch of the overbead countershaft of the lathe, and in many other situations where the release of the friction is the easiest and most natural movement. To be sure, io this case the amount of contact is very large-the entire circumference of the pulley-but the principle is the same; for where the pulley friction clutch must be beld as a one with the moving pulley, so the friction wheels are one so long as they are in contact, and their contact is a mere point against the circumferential contact of the pulley clutch.
An objectionable method of employing the friction driving is to use a metallic surface against a wooden or a leather surface; two surfaces of wood are better; but if iron and leather or iron and wood are used together, the driver should, in all cases, be made of the softer material. For when the driver is throwu in contact with the driven, it must make a number of revolutions before its contact will be sufficient to start the driven wheel. It is evident, there fore, that if the driver is of iron while the driven is of some softer subslance, it (the driver) will wear a crease that will injure the surface of the driven wheel. It is much better, where it is practicable, to make both the driving surfaces of wood.
Excellent wheels are made of maple-hard rock mapleand of lignum vitex, the lignum vitæ wheel to he the driven and the maple the driver. The wheels should be a cast iron spider made to receive the wood, which should be sawed into wedge-sbaped or radial segments, so that the end grain of the wood bears and makes the contact surfaces. Excelof the wood bears and makes the contact surfaces. Excel-
lent results bave beeu obtained, also, with bard rubber (vullent results bave beeu obtained, also, with bard rubber (vul-
canized) aud wood, where there was no oil to rot the rubber, and for small wheels there is nothing better than raw bide as prepared for pickers for looms and for small gears. This will stand oil and resist its disintegrating influence.
One of the advantages of friction wheels over cogged wbeels is that when they are started there is no shock, but ony a' gradual coming up to speed. Another is their noise-
lessness; but the epicycloidal cutting of gear teeth latterly has made this objection untenable, as gears can be run as silently as belts. But a great advantage is the very slight movement necessary to connect and disconnect, the actual surfaces requiring to be merely and barely separated to in sure a stoppage of motion

## variations of speed.

The contrivance of step cones with shifting belts is a cumbersome and troublesome one for procuring gradations of speed. In many cases it answers its purpose, but in others some more sensitive and intermediate device would be better. A change of speed is readily obtained by a change of position of a driven wheel on the face (side) of a driver wheel or disk. The face of this disk may be either straight or slightly dished, and the driveu roll or small pulley traverses the face of the disk from the shaft to cir cumference. It is evident that while the driven wheel is nearest the shaft of the disk it will revolve the slowest; and also it is evident that as the driven wheel is run out toward the circumference of the disk it will revolve the faster.
The shaft of the driver-the disk-is, of course, at right angles to that of the driven pulley; these relative positions must be maintained. But it does not matter, in practice whether the disk is on a horizontal or a vertical shaft, so long as the driven is so arranged as to be permitted to be placed in contact with the disk at any point from center to circumference.
This device, with some modifications, has already been employed in the machine driving of potters' wheels and in the foot driving of sewing machines. But it is capable of a wider adaptation, especially in the machine shop, where suddeo changes or quick variations of speed are t'requently necessary. The large disk may be of cast iron turned and finished, and the driven wheel of iron, leather faced, or of wood. The progress of the driven wheel from shaft to circunference of the disk-from low speed to high speedcould be controlled by lever, worked by hand or by foot treadle. It is a much closer and more sensitive device than the present system of absolute changes of speeds on our lathes and drilling machines.

## the greely expedition.

It was August 18,1881 , that the officers and crew of the Proteus bade good-by to Lieutenant Greely and his little band, twenty-five in all, leaving them in camp, as an advance guard of explorers, in a high northern latitude. The exploration in which they were engaged was not one for the advancement of material aims or the ambition of governments to enlarge tideir dominions-it was one solely in the interest of science, to widen the domain of knowledge, and help us to better know the laws which affect the conditions of life and growth on this planet, as well as to throw light, if possible, on that great field of research, so largely speculative, in which we are seeking to find out something of the universe. It wasnot until the 22 d of June, 1884, a little more than $t$ wo years and ten months after the party had been left on the shores of Lady Franklin Bay, that seven of them, the only living members of the original band, were relieved of their long vigil by the appearance of the vessels of the government expedition under Commander Schley. Seventeen of the others had died of starvation, one was drowned while ealing to obtain food, and of those found alive one died subsequently from the amputation of limbs made necessary by frost bite, so that only six of the original twenty five remained alive to reach home again.
The story of the expedition, the plans of the scientific bodies and Arctic explorers which led up io it-in connecion with several other observation posts around the poleas well as the futile efforts of 1882 and 1883 to reach and releave the colony at Lady Franklin Bay, have often been told. It was the understanding when the station was estab-lished-subject to the discretion of Lieutenant Greely, as circumstances might affect the situation-that if goverument relief did not reach the station during the summer of 1882 , the party would endeavor to work its way southward in the summer of 1883 as far as Cape Sabine, or make its quarters on the west coast as far south as might be practicable, and yet within the possibility of being reached by a relief expedition, but that the route would be on or along the west coast, and not on the Greenland side. In accordance with this idea Lieutenant Greely abandoned his quarters at Fort Conger, on Lady Frauklin Bay, August 9, 1883, and reached Baird Inlet, near Cape Sabine, September 29, with the entire party well up to that time. Great difficulty was experienced in getting to that point, with the instruments and records of observations, and as large a supply of provisions as it was possible to convey. He was obliged to abandon all his boats, and was adrift for thirty days on the ice in Smith's Sound, the party finally making its way across au almost impassable tield of ice bummocks to a landing just north of Cape Sabine, where a permanent camp was established October 21.
Here the party found that a very insufficient supply of provisions had been left, while some of those thus obtained bad been left by Sir George Nares as long back as 1875, and were of course much damaged. It was known that supplies had had been left on Littleton's Island, almost opposite Cape Sabine, on the east side of Smith's Sound, but the channel did not close all winter on account of violent gales and the strong currents, and there was no means of reaching the food that was so near. The party was immediately put on short rations, but on May 14, 1884, the last regular food was is-
ued. After this the men were forced to live on boiled sealskin strips from their sealskin clothing, lichens, and shrimps, game having failed despite daily bunting from arly in February
One had died in January, 1884-the first death of the party-then five died in April, four in May, and seven i June, up to the 22 d , when the rescue was made, and when according to Commander Schley, "forty-eight hours' de lay in reaching them would have been fatal to all." Too high praise cannot be accorded to Commander Schley fo the energy with which be pushed north so early in the sea son, fighting his way almost inch by inch through the ice; but it will be remembered with a feeling of sadness, if not of severe reprobation, that three United States vessels, the Yantic, the Proteus, and the Neptune, had visited the near locality of Greely's fatal camping ground, during the sum mers of $188 \%$ and 1883, with ample provisions, and come home again without leaving there the supplies that would ave prevented these men !rom starving
It is too early to say what will be the probable value of the information obtained by this expedition. Up to the fall of 1883 its success seems to have been all that could bave been desired by its promoters, and in the journey southward copies were brought of meteorological, tidal, astronomical, magnetic, pendulum, and other observations, although some photographs, Esquimau relics, and other things were necessarily left behind. It is probable, however, that Lieut. Greely made all the observations required by the Interna tional Conference at Hamburg, under whose directions the various circumpolar stations were established, and that sub stantially all such records have been saved. The dis tinguishing work of the expedition-that which will per-

haps give it most fame-is thus announced by Lieut. Greely: "For the first time in three centuries England yields the bonor of the furthest north," which had previously been $83^{\circ} 20^{\prime}$, but was marked at $83^{\circ} 24^{\prime}$ by Lieut Lock wood of the Greely expedition, on May 13, 1882. The point of observation was named Lockwood Island, where, ' from an elevation of 2,000 feet, they saw no land north or northwest." To the east and northeast of Lady Frankin Bay the party undoubtedly made the best survey yet accomplished of northern Greenland, and, by observation of what seemed to be a distant headland, located it as Cape Robert Lincoln, in latitude $83^{\circ} 35^{\prime}$, longitude $38^{\circ}$ west of Green wich.
At B, in our map, is shown Lock wood Island, the highes northern latitude yet reached, and from whence the obser vation was made, while A marks the lighest point attained by Commander Markham, the most successful British ex plorer, in 1876. In a subsequent endeavor to go still farther north, the party was turned back by open water, and, as Greely's report says, "barely escaped drifting into the Polar Ocean."
There are many other newly named places, and some material changes will have to be made in the maps of regions hitherto incorrectly laid out, along the west shor of Kane Basin and Kennedy Clannel, and in the configura ion of Grinnell Land, and the north shores of Grant Land and Greenland. Arctic geography will thus, doubtless, be greatly amended, but whether the results attained will prove sufficient compensation for the loss of life of the brave men who were sacrificed is a query which many people will hink most unsatisfactorily answered.

Glabs Making in Italy.-Colle de Val d'Elsa contain ane of the most imporiant glass works in Italy. The value of the annual production amounts to $2,500,000$ lire; its sale extends over all Italy, but more especially in the Roman Tuscau, and Piedmontese proviuces.

## LABELS AND TRADEMARKS

In the year 1874, the duty of registering labels, hitherto performed in the office of the Librarian of Congress, wa transferred to the Commissioner of Patents. In accepting his office the Commissioner for some reason imagined it part of his duty, when a label was presented for registra tion, to exercise judicial functions in deciding whether i was a label or trademark from a prima facie standpoint. The label after one or more examinations was pronounced eligible for one of the forms of protection, except in com paratively rare cases, when something obviously neithe one nor the other would be entirely rejected. In the num bers of the Official Gazette prior to 1882 several decisions of the Commissioner on this subject will be found. In virtue of such decisions many labels were refused registration o account of their arbitrary and non-descriptive character aud were brought into the trademark class. The definition of a label that was the working standard of the office was taken from Webster's Dictionary. It reads as follows: "A narrow slip of silk, paper, parchment, etc., affixed to any thing, denoting its contents, ownership, and the like; as the label of a bottle or a package." (O. G., August 10, 1881.) From this it was assumed that a label must be descriptive f something connected with its object, and everything in the shape of an arbitrary or non-descriptive symbol th Commissioner refuscd to register except as a trademark.
This practice prevailed until the year 1881, when two ver mportant events took place. The first of these was the passage of the new trade mark act of March 3, 1881. This was to replace the old statute, which bad been declared unconstitutional. By it the additional restriction was placed upon trademarks, that in order to be subjects of protection by the United States courts they must be used in commerce with foreign nations or some Indian tribe. In the old prac tice of the Patent Office almost anything that they decided to be unregisterable as a lavel could be registered as a trademark. But this new restriction threw out a great many quondam registerable trademarks, and in conjunction with the Patent Office rulings deprived many labels of any regis tration whatever.
This state of affairs quickly became oppressive, and the important decision of the Supreme Court of the District of Columbia in the case of the United States vs. the Willcox \& Gibbs Sewing Machine Company came in good time to relieve it. This was the record of the important events alluded to above. The court held that the Commissioner had no right to exclude from copyright registration any label under the guise that it was a trademark. The Commissioner at once accepted this decision, and changed the practice of the office to correspond therewith.
All went satisfactorily under the new ruling, and the interests of private individuals and of commerce at large were equally guarded. The Supreme Court, although it did not base its decision on the intrinsic qualities of labels and trade marks, reached by other ways a thoroughly common sense and practical conclusion. The acquiescence of the Commis sioner in the spirit of the decision was full and complete. Less than a year ago a new Commissioner of Patents was appointed. At first he followed the revised practice of his predecessor, but recently, in the face of the decision of the Supreme Court, he has returned to the old practice, and exercising bis powers of judgment attemp,ts to discriminate between labels and trade marks. No court in this country is in better repute than the Supreme Court of the District of Columbia. It is the great court of appeal from the decisions of the Commissioner, and its decisions would seem to be particularly binding upon his actions. Yet his new rulings are directly iu the face of and contrary to the decision of November 30, 1881, and be apparently wishes to have a decision from a bigher tribunal before changing his views.
Leaving for the present the relations existing between the Commissioner and the Supreme Court of the District, we may glauce at the hardship inflicted by this course upon applicants for registration of trademarks. On application a fee must tirst be paid, which fee is not returned. If the label is decided not to be registerable as such, the applicant, pocketing his loss, may apply for trademark registration, paying another and larger fee. Here too he may be ruled out, when he is left wilhout any way of recovering his fees, and without any equivalent being awarded him for them. Rulings that lead to this result are wrong. The Commis. sioner has no responsibility in the matter if he will follow the voice of the court, his direct superior. But of his own volition he has taken the responsibility of departing therefrom, and has chosen to inflict this petty hardship upon many who are ill ableto afford it.

## Car Couplers.

According to a statement made before the Master Car Builders' Association, there are now in use in this country 800,000 freight cars, and the average annual expense for inks and pins for each car is $\$ 1.50$, or a total of $\$ 1,200,000$. It is evident that a self-acting car coupler, so made as to prevent the maiming, loss of life, and expense of the common link and pin system, would be an invention of enormous value. Many hundreds of patents have been taken for improved car couplers, but the railway companies, for one reason or another, are shy about introducing them. In Massachusetts a law has been passed compelling all railway companies in that State to put self-acting couplers on their cars on or before 1885. If other States would adopt compulory laws on the subject, the introduction of improved couplers would soon become general

