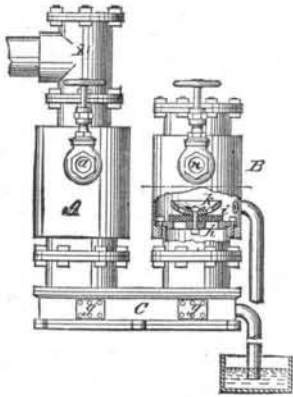


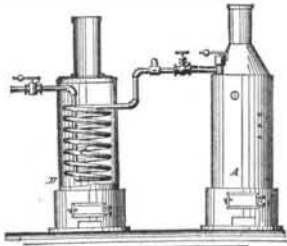
**ENGINEERING INVENTIONS.**  
**Condenser for Steam Engines.**

The device illustrated by the accompanying engraving is an improved condenser for steam engines, in which the vacuum is maintained and is so constructed as to be easy of access to the interior for cleaning. A is the water chamber, and B the air chamber, both of cylindrical form, and are both secured in an upright position on the hollow base, C. The water cylinder is provided with a pipe for supply of cold water, the pipe having a valve for regulating the supply, and the upper end of the cylinder is formed with a short tube having flanges, to which is bolted a T coupling for connecting the exhaust pipe of the engine. On the upper end of the cylinder is attached a cap. The object of this construction is to save stopping the engine for any length of time when the condenser requires cleaning or repairs. In that case the cap will be removed, a pipe secured in its place, and a plate placed between the T and the tube on top of the cylinder, and the engine then may be run by high pressure. From the end of the base, C, a discharge pipe extends into a tank that contains water to prevent air entering the base, and on the sides of the base are manholes for cleaning it out. In the air chamber, B, is fixed a perforated plate on which is secured a disk valve of flexible material, and above it is a guard that limits the movements of the valve in opening. The cylinder has a discharge pipe for air, and a removable cap is placed on the cylinder to allow access to the valve. When the exhaust steam enters the condenser the shock will raise the valve, and the air will pass out of the pipe, thereby insuring an instantaneous vacuum, the closure of the valve on its seat preventing any return of air. This condenser is patented by Mr. Richard E. Williams, of Grass Valley, Nevada county, Cal.



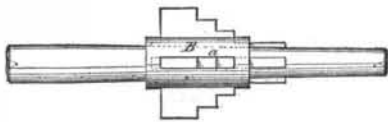
**Superheater for Steam.**

Mr. John Fish, of Summit, Union county, N. J., has patented a new and useful combined steam generator and superheater, that is shown in the accompanying engraving. A is a steam generator, from the steam space of which a pipe leads to a coiled pipe within the furnace, D, forming the superheater, and from the coiled pipe a pipe leads to the place where the steam is to be used. The generator is provided with a safety valve placed in the ordinary manner, and the pipe leading from the generator has a stop valve for preventing the escape of steam from the generator when desired. This pipe is also provided with a check valve opening toward the superheater. The discharge pipe of the superheater has a throttle valve so that the superheated steam may be detained in the heater until raised to the desired temperature, and between the throttle valve and the heater is a safety valve to prevent the pressure of the steam in the heater from rising to a dangerous point. When thus constructed and the throttle valve is closed, the steam can be superheated until its pressure reaches the point at which the safety valve is set, and drawn off when desired through the throttle valve, and the check valve prevents any back pressure on the generator from the superheated steam, so that a generator of ordinary strength can be used.



**MECHANICAL INVENTIONS.**  
**Expanding Mandrel.**

An improvement in expanding mandrels for use in the manufacture of eccentrics, nuts, bands, etc., is patented by Mr. William H. Nicholson, of Wilkesbarre, Luzerne county, Pa., and is shown in the annexed cut. A plain tapered arbor or mandrel adapted to be held between the centers of a lathe has placed upon it a straight sleeve, that is of greater internal diameter than the external diameter of the arbor, and is formed with longitudinal slots. Notched arms are fitted in the slots, and are projected therefrom by the arbor which bears upon them, their outward projection being limited by lugs at their ends, taking hold beneath the sleeve. The arms are tapered on their inner edges to correspond with the taper of the arbor, so that their outer edges shall be parallel with its axis. The outer edges are formed so as to be adapted to the work they are to hold, and by forcing the tapering arbor, endwise, the arms are projected so as to take frictional hold of the work, and by forcing it in the

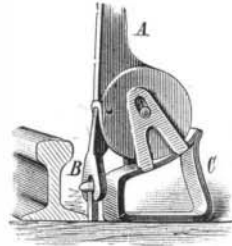


opposite direction the work is released. This mandrel is peculiarly adapted to holding the various kinds of work for which expanding mandrels are used.

**Railroad Spike Extractor.**

Messrs. William B. Turner, of Long Island City, Queens county, N. Y., and Albert P. Prout, of Woodhaven, same county and State, have patented a new and improved claw-bar for drawing railroad spikes, which is shown in the annexed engraving.

A is a lever whose lower end is enlarged eccentrically, and is slotted edgewise or from front to rear to permit the claw, B, to swing freely, and to afford lateral bearings to the side arms or supports of the swinging fulcrum, C. On a transverse pin on one side of the eccentric the claw, B, is pivoted so as to hang in a perpendicular line with the handle of the lever. Through the center of the eccentric is passed a rod from whose outer ends is suspended the swinging fulcrum, C, by means of side hangers or supports whose eyes are slotted so that the fulcrum may adjust itself in suitable position as a bearing for the lever, A. The claw-bar may be applied to spikes between contiguous rails, where great difficulty is experienced in applying an ordinary claw-bar, by resting the lower edge of the eccentric on the top of the rail; with the bar, A, inclined slightly rearward, the claw may easily grasp the spike, and by motion of the lever drawn, the swinging fulcrum resting unused on the outside of the rail.



**Sash Fastener and Holder.**

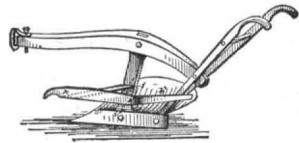
We find among recent inventions a new sash fastener and holder that is automatic, and so constructed that it is not necessary to hold back the latch with one hand while raising and lowering the sash. It is shown in the annexed cut, and is patented by Mr. Harry Greenfield, of Harrison, Hudson county, N. J. The device consists of a locking catch, A, a holding catch, B, and holders, C, of which there may be two or more secured to the frame of the window for holding the window at different heights.



The locking catch is formed with a cam projection, and is loosely pivoted to a lug formed on a plate screwed to the window frame. The holding catch, B, is formed at its lower end with a rounded nose and a finger lift, and is loosely pivoted to a plate secured to the sash by suitable means, and the holder, C, is formed with an overhanging deflector, under which is a detent to receive the nose of the catch. The plate of the holding catch is secured to the sash in such position that the nose of the catch will ride on the window frame, and when the sash is lowered it will ride over the projector of the locking catch and drop under it and lock the window, and when the sash is raised will drop into the detent of the holder and support the window.

**AGRICULTURAL INVENTION.**  
**A New Plow Attachment.**

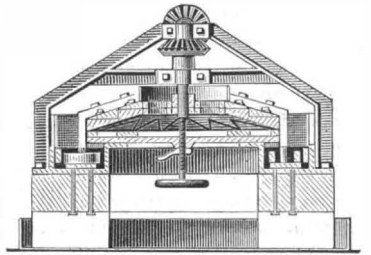
Mr. Thomas P. Wise, of Gravel Hill, Buckingham county, Va., has patented a new and improved attachment to be secured to the land side of a plow, which will cut away a slice of surface of the soil, between the plow and the plants to be cultivated, removing the grass and weeds and carrying them into the furrow in the rear of the plow. The standard of the plow is of ordinary construction, and is provided with a series of recesses and holes, to which an inclined horizontal cutting blade provided with a shoulder on its inner end and a threaded screw may be attached by a corresponding nut, and may be adjusted up or down as desired. The blade may be cast so as to be slightly elevated at its outer end when attached to the standard. The cutting edge of the blade projects out forward beyond the upper edge of the mould board and in line therewith. A wing is firmly secured to the outer end of the blade at right angles to it and parallel to the land side of the plow, and at its rear end is bent inwardly. The front end of the wing is provided with a downwardly projecting hook, adapted to run under vines and cause them to ride over the upper edge of the wing, the rear bent end carrying them into the furrow. The invention is shown by the annexed cut.



**METALLURGICAL INVENTION.**  
**Ore Grinding Mill.**

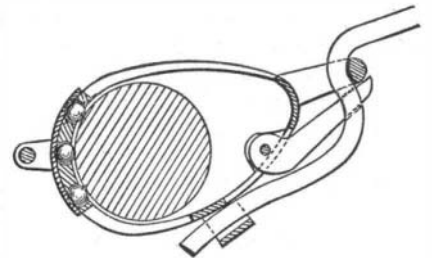
Mr. William E. Harris, of New York city, has invented and patented an improved ore grinding mill, by which the grinding and preparation of ores of all kinds is greatly facilitated. The accompanying engraving shows the construction of the mill. To the upper part of the frame of the machine is attached bearings, in which revolves a horizontal shaft, having upon its outer end a fast and a loose

pulley. To the inner end of this shaft is secured a bevel gear wheel, which meshes into the teeth of a bevel gear wheel placed upon the vertical shaft, and connected with it by a slot and feather so that the gear wheel will carry the shaft and also allow it to move up and down freely. The bevel gear wheel is kept to its place by the collar attached to the frame. To the lower end of the shaft is secured the upper grinding plate, which is strengthened by a plate bolted to its upper side and to which is attached the hopper to receive the ore. The lower face of the upper grinding plate is made conical, and has V-shaped grooves dressed in it to facilitate breaking the ore. The face of the lower grinding plate has radial grooves formed to operate in connection with the V shaped grooves in the upper grinding plate. The lower plate is bolted to a strengthening plate which is bolted to a ring flange formed around the upper inner edge of the ring trough. To the upper side of the strengthening plate are bolted angular arms, the lower ends of which project into the trough and have their lower ends rounded to serve as journals for the ring plates placed within the trough and resting upon a lining plate attached to the bottom of said trough. To the inner surface of the outer sides of the trough are also bolted lining plates, against which the outer sides of the ring plates work. The lining plates of the trough are dressed with grooves. Through a screw hole in the strengthening plate passes a hand screw upon which rests the lower end of the upright shaft. With this screw the upper grinding plate may be adjusted at any desired distance from the lower plate, as the character of the ore may require. As the ore is fed into the hopper it passes between the grinding plates and is crushed, and fed outward by centrifugal force, and escapes into the trough, where it is further ground, the pulverized ore escaping through a screen into a receiver.



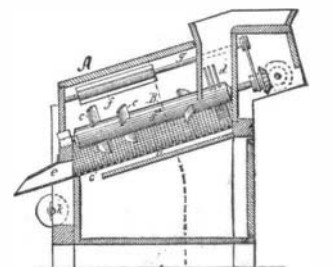
**MISCELLANEOUS INVENTIONS.**  
**Shaft Loop for Harness.**

Among the recently patented novelties is a new shaft loop for harness saddles, that is so constructed that the shafts of the wagon can slide through it very easily, and at the same time is more durable than those in use heretofore. It is clearly shown in the engraving. A buckle frame is rigidly formed to the upper end of the shaft loop of a harness saddle, and the tongue of the buckle is rigidly pivoted to the side of the loop. The lower part of the loop is provided with a series of recesses in which balls are placed, which are held in the recesses by a plate fastened on the under outer side of the shaft loop, and they project slightly from the inner surface of the loop, so that the shaft will rest on them and they will revolve as the shaft passes backward and forward through the loop. By providing the shaft loop with an anti-friction bearing for the shafts the defects of the ordinary shaft loop are avoided, for if there is no friction between the shaft and the loop to move the latter, there will be no chafing of harness or animal. With this bearing for the shafts the buckle of the loop need not be pivoted, but may be made rigid, and will be stronger than the ordinary method. This device is patented by Mr. Peter Casey, of Providence, Providence county, R. I.



**Improved Cotton Whipper.**

A new and improved device for whipping and cleaning cotton was recently patented by Rose H. Goldsmith, of Charleston, Charleston county, S. C., and is illustrated by the accompanying engraving. A is a box of oblong form and has an inclined bottom formed of wire cloth. At its upper end is a feed spout, in which is placed the cotton to be whipped, and a shaft, B, carrying whipper arms that are arranged spirally around it and extend nearly in contact with the rounder wire bottom of the box. On the upper end of the shaft, B, and within the spout are arranged arms that carry the cotton from the spout into the box, and at the lower end of the shaft is a delivery opening and spout. Parallel to the shaft, B, and above it is a shaft, on which is a roller provided with longitudinal blades, and the shafts are connected by a belt and pulleys, while the shaft, B, is provided with a bevel pinion, which

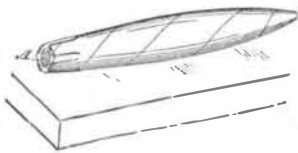


meshes with a similar one on a cross shaft that is driven by a belt from a main shaft.

The cotton is placed in the spout and carried by the feed arms into the box, where it is thoroughly separated by the whipper arms and carried to the delivery end without cutting the staple. The dust escapes through the wire cloth bottom, while the roller serves to press the cotton against the whippers.

#### Cigar Lighter.

A novel cigar lighter, by which the use of matches for lighting cigars is dispensed with, and that is attached easily and rapidly, and is readily and cheaply made, is patented by Mr. Alfred C. Moss, of Allentown, Lehigh county, Pa., and is shown in the accompanying engraving. A is an inflammable wafer made of the igniting compound ordinarily used on friction matches. To the wafer is attached wings made by cutting out a cross of paper, and they are cemented to it by placing the wafer when in a molten condition in the center of the cross, and as soon as it has cooled the wings will be found to be firmly attached. The wafer is placed against the end of the cigar, and the wings are bent over on the sides of the cigar and secured by some suitable adhesive material applied on the wings, thus holding the wafer firmly on the cigar. By rubbing the wafer over any suitable surface the friction produced will cause ignition, and the cigar will be lighted. No deleterious gases are drawn into the cigar, and the end is not cracked or broken, but rather strengthened by the wafer wings.



#### Improved Blacksmith's Hammer.

Mr. Martin M. Fish, of David City, Butler county, Nebraska, has patented a mechanical striker for blacksmiths' use, to be operated by the foot. It is so constructed that a powerful blow may be given with little exertion, and it may be set to suit any position of the anvil, and will strike a square or diagonal blow as may be desired.

The accompanying engraving shows the devices by which these results are accomplished.

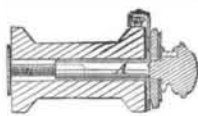
The standard is formed with a socket at its upper end, provided with a threaded opening at its bottom, through which the threaded shank of the head passes. This head is forked, and between the upper ends of its arms is journaled a shaft having a socket near its center, in which the handle of the sledge is placed. The socket is made larger than the handle so as to admit the thimble, which is perforated circumferentially with holes, in which are placed set screws for holding the sledge in the socket, and for adjusting it so that the face of the sledge will deliver either a flat or diagonal blow.

Secured upon the shaft between the arm and the handle socket is a pulley which is connected with the foot lever by a chain. Attached to the shaft is a coil spring of sufficient strength to raise the sledge to a vertical position and retain it after it has been brought forward by pressure of the foot lever to deliver the blow. Back of the sledge is placed a curved spring, fastened to the frame and supported near its center by a brace. This spring is used to overcome the momentum of the sledge (given by the coil spring on the shaft) after it arrives at its vertical position, and it converts this backward force into power for increasing the force of the next blow of the sledge. Only a light pressure, aside from this force, is necessary to be applied to the pedal to deliver a succession of effective blows. By this ingenious device the workman, with slight additional expenditure of force, becomes both blacksmith and helper.



#### Thread Holder and Cutter.

Among recently patented novelties we find a thread holder and cutter, invented by Mr. Fred. S. Williams, of New York city, the object of which is to cut the thread unwound from a spool and also to prevent the unwinding after the thread is cut. The device is shown in the annexed engraving. A rod, A, adapted to pass into the hole in the center of thread spools, has at its inner end a screw-threaded hole, and at its outer end a head. A plate that has a screw-threaded projecting stem is passed into one end of the hole in the spool, and the rod, A, in the other end, when the stem and rod are screwed together, holding both parts in the spool. A strip provided with a longitudinal slot at one end has the opposite end bent to form a hook, and in the central part of the hook is fastened a spring clamp, formed of two flat pieces of spring material resting together. This strip, in connection with a washer and washer spring, is placed between the head of the rod, A, and the end of the spool. The head of the rod is provided with a small knife securely fastened to it. The thread is unwound from the spool and passed through the

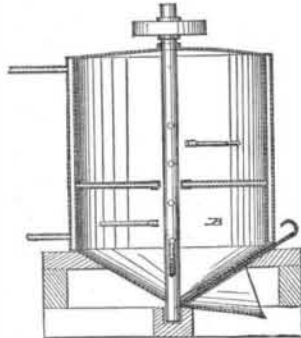


spring clamp, or under the washer at the end of the spool, that hold it firmly and prevent it from unwinding. The part that is unwound is passed around the head of the rod, A, and pulled, when the thread is pressed against the knife and cut.

#### Grain Cleaner.

A simple and practical device belonging to that class of apparatus in which grain is cleaned by stirring it in a cylindrical or other shaped vessel, by means of arms attached to a rotary shaft, has been patented by Messrs. Jack. M. Shackelford and John W. K. McClure, of Blue Mound, Macon county, Ill., and is shown in the annexed cut.

The working parts of the apparatus are supported by a frame of any suitable description. B is a cylindrical vessel having a funnel-shaped bottom and provided with hollow arms extending toward its center. These arms consist of pipes having their outer ends open and their inner ends closed by caps. Surrounding the vessel, B, is a casing, between which and the vessel is an annular steam chamber, communicating with the above described pipes. The chamber has an inlet pipe near its lower end and an outlet near its upper end for supplying it and the arms with steam, to keep them hot. In the center of the vessel, B, works a vertical shaft, the lower end of which is stepped in the supporting frame, and the upper end is provided with a pulley. This shaft carries a number of radial arms that are arranged to work between and above and below the hollow arms. In the bottom of the vessel is a slot with a sliding gate, and underneath is a spout leading to a receptacle. The grain is placed in the vessel, and is cleaned by the stirring arms when the shaft is rotated, after which it passes out through the slot, the size of the opening being regulated by the gate. By surrounding the vessel with a steam-tight jacket, and making the hollow arms steam-tight, all the advantage of heat from steam is obtained without the disadvantage of the moisture imparted by the steam, when it is allowed to come in contact with the grain.



#### Wine Analysis.

BY PROFESSOR L. ROESLER.

##### QUANTITATIVE ANALYSIS.

1. *Specific Gravity.*—The most accurate results are obtained by the use of Sprengel's pycnometer, or specific gravity bottle. For practical purposes it suffices to use a hydrometer carefully graduated and compared. Before every operation it must be carefully washed with water and alcohol and kept in a case to protect it from dust.

2. *Percentage of Alcohol.*—The simplest way is to take 100 c. c., or, better, 200 c. c., and distill off two-thirds, then dilute the distillate to the original volume and take its specific gravity. As some acetic acid distills over, it is well to add 50 c. c. of lime-water and 50 of water to the first distillate, and then distill off 100 c. c. The percentage of alcohol is just half of that corresponding to the gravity found. In wine that foams much add 0.2 per cent. of tannin.

3. *Extract.*—If this is found by evaporation to dryness on a water-bath, the results will be too low, because the glycerine goes off and some of the extract suffers decomposition. A temperature of 80° C. (176° Fahr.) must not be exceeded; or the drying is done in vacuo. The best way is to put the wine in a stoppered vessel on a sand-bath at 60° C., and put this under the receiver. The extract can be found from the specific gravity of residue left after the alcohol has been distilled, by means of Balling's tables.

4. *Free Acid.*—This is best determined by titration with a potash solution of such strength that the number of cubic centimeters required to neutralize 10 c. c. of wine will give the grammes of tartaric acid in a liter of wine. To determine the cream of tartar, 10 c. c. of wine is treated with 50 c. c. of alcoholic ether, and left to stand for twenty-four hours, and then filtered, and the bitartrate washed out with alcoholic ether, then dissolved in boiling water and titrated with potash solution. The free tartaric acid is found by neutralizing 10 c. c. of wine with the above potash solution, mixing with 40 c. c. of wine, and then estimating the cream of tartar in 10 c. c. of the mixture, as before described. Of course, the quantity of potash added to 10 c. c. must here be taken into account.

5. *Tannic Acid.*—This may be estimated by Neubauer's modification of Loewenthal's method. The alcohol is first expelled from the wine, and the residue restored to its original bulk, and then titrated with permanganate of potash and indigo carmine. Since there are other things in wine which will reduce the chameleon solution, it may be first shaken with pure bone-coal before titrating.

6. *Acetic Acid.*—The Kissel-Neubauer method is employed, 50 c. c. of wine being rendered slightly alkaline with baryta water, the alcohol evaporated, the precipitate filtered out, and phosphoric acid added to the filtrate. This is repeatedly distilled, replacing the water that goes over. These several distillates are united and titrated. Weigert distills 50 c. c. wine on a salt-water bath, under reduced

pressure, and repeats the operation after adding water to the residue.

7. *Sugar.*—The wine is first decolorized with bone coal, or acetate of lead, and the titrated with Fehling's solution. Either the original wine can be taken, or a solution of the extract, for alcohol has no effect upon the Fehling copper solution.

8. *Glycerine.*—According to Neubauer and Reichardt 100 c. c. of wine is evaporated to one-third in a porcelain dish, slaked lime enough added to make it alkaline, and then evaporated to dryness. The residue is extracted by boiling it with 90 per cent alcohol, evaporating the solution to dryness, dissolving in alcohol again, and then adding ether. If any precipitate forms, filter it out and let it evaporate spontaneously.

9. *Nitrogenous Matter.*—Vegetable albumen and gelatine are only present in small traces. To estimate them, evaporate 10 to 20 c. c. of wine in a very thin glass dish, pulverize them together, and burn them, as in the Will and Varrentrapp method.

10. *Ashes.*—Evaporate 50 or 100 c. c. of wine in a very capacious platinum dish, drying, and burning at a low red heat. The separate constituents of the ash may be determined in the usual manner.

#### QUALITATIVE ANALYSIS.

So many methods have been given for detecting coloring matter that we cannot mention them all here. As a general thing, if a red wine is not decolorized by nitric acid it is genuine. If it is decolorized this is no proof of genuineness.

Polarization is a sufficient test for potato- or starch sugar. If the rotation in a 200 c. c. tube in Wild's polariscope exceeds 1° to the right, grape sugar is present. Pure wine only rotates the light from +0.1° to +0.3°. Polarization is also used to test for cane sugar. For this purpose 50 c. c. of wine is mixed with 5 c. c. hydrochloric acid and heated ten minutes to 70° C. and read, the reading being increased one-tenth for the dilution with acid. If it rotates more to the left after than before, cane sugar is present.

Salicylic acid is tested for in wine free from tannin only by extracting with ether. Tannin is not soluble in carbon disulphide, while salicylic acid is soluble, although not very. Hence equal volumes of wine and disulphide are shaken together, and the latter tested with perchloride of iron solution.

To test for sulphurous acid 50 c. c. of wine is distilled with careful cooling until 3 c. c. comes over. The distillate gives a white precipitate with nitrate of silver, soluble in nitric acid.

It is important to test for inosite, because it is present in all natural wines, but owing to its cost is not used in making artificial wines. In making this test at least half a liter of wine is precipitated with sugar of lead, filtered, and acetate of lead added. The precipitate is washed out, then suspended in water and decomposed with sulphydric acid, again filtered to remove the sulphide of lead, and the filtrate evaporated to the consistency of a sirup, and then treated with four times its volume of absolute alcohol. At the end of twenty-four hours the resulting residue is dissolved in water, decolorized with charcoal, and the solution evaporated to dryness. If inosite is present this residue will give a pink coloration with a drop of the nitrate of mercury solution.

Arsenic may be in the fuchsine used to color wine; heavy metals like lead, copper, mercury, and zinc may get in accidentally or be introduced intentionally. They are detected in the usual manner.—*Chemiker Zeitung*, No. 16.

#### Progress of Domestic Comforts.

Among the recently granted patents is one for the cooling of dwelling houses, offices, hotels, etc., by means of compressed gas, which is conducted from a street main into the premises in pipes like ordinary gas. The compressed gas on being allowed to expand within a suitable receptacle, produces a very low temperature. Thus the housekeeper, simply by turning the gas faucet, will be able to make ice, supply the dwelling in hot weather with cold air, and produce all forms and degrees of refrigeration with the utmost facility. Our houses being now supplied from street mains with cold water, hot water, compressed gas, and electricity, we now only need, to complete the comforts of living, a milk main and tea and coffee mains; after which perhaps the public will call for soup pipes.

#### The Transit of Venus.

Already about forty expeditions have been projected for the observation of the coming transit of Venus. The number will be considerably increased by those of the United States, Italy, and Austria, yet to be announced. The French have fixed upon eight stations: In the north, Florida, Col. Perrier; Cuba, M. d'Abbadie; Mexico, M. Bouquet de la Grye; Martinique, M. Tisserand. In the south, Santiago du Chili, M. Leclerc; Santa Cruz, M. Fleuriat; Rio Negro, M. Perrotin; Port Desiré, or Chubutt (Patagonia), M. Hatt. These missions will start in July. Each will have two equatorials, one 8 inch and one 6 inch.

A ROAD locomotive for war purposes, lately tried, weighed 28½ tons, and drew easily 40 tons weight of guns mounted on their carriages fully equipped. Its maximum traction power is 150 tons, and its cost of maintenance is about 30 cents an hour.