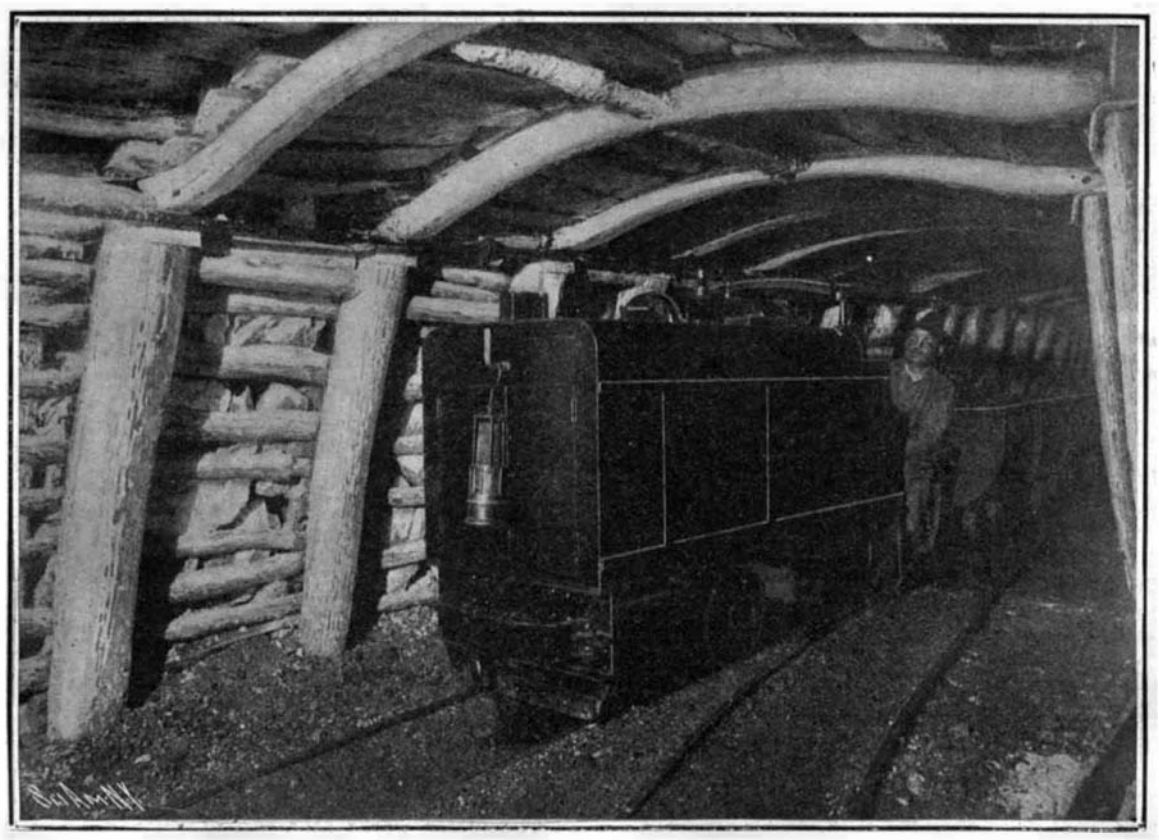
## GASOLINE LOCOMOTIVES.

BY OUR BERLIN CORRESPONDENT.

Locomotives driven by gasoline motors possess a number of special advantages which particularly adapt them for use on temporary forest and field railways, and mining railways. They are also useful as drill engines, in which connection they even prove preferable to electrical locomotives, dispensing as they do with the necessity of a special power station and current-conducting lines. Steam operation is on the other hand quite impracticable in mines, and in the case of forest railways gives rise to the danger of fire, especially in dry weather, owing to the sparks flying about.

The construction of motor locomotives for benzine, alcohol, and gasoline operation has been developed by the Deutz Gasoline Motor Works, of Cologne-Deutz, Germany, to whose courtesy we are indebted for the accompanying photographs representing some typical plants. The general arrangement of these motor locomotives is as follows: A horizontal motor is mounted on a frame resting by means of springs on the running axles, the power of which motor is transmitted to these axles through the intermediary of gearing situated at the side or rear of the motor. In the case of mining and field railway locomotives, the fuel reservoir is inserted in the cooling water reservoir, both being located above the motor. In drill engines and motor cars for the operation of tramways, the water reservoir rests on the frame, while the fuel reservoir is situated above the motor, as in the case of mining and field railway locomotives. The various parts of the engine are protected against dust by means of a sheet-metal casing. Ignition is effected by a magneto operated by the engine. The power is transmitted to the running axles by means of a chain and sprocket wheel thrown in and out of gear by friction clutches. According to the conditions of the case, the locomotives are designed with one, two, or more transmissions in the driving gear, admitting of both forward and backward running at the speed produced by the latter. Single transmission locomotives are mainly used in mining plants, where only small gradients are generally to be dealt with at moderate speeds (about 3.75 miles per hour). For any higher speed on horizontal tracks or for the hauling of trains over steeper gradients, the locomotive is fitted with a driving gear having two or more transmissions. The maximum speed of these locomotives is reduced either by using greater ratios of transmission or by acting on the governor. In order not to vitiate the air, the exhaust gases of mining locomotives are entirely condensed. These engines are designed for any outputs intermediary between 6 and 60 horse-power.



AN 8-HORSE-POWER GASOLINE MINING LOCOMOTIVE.

A Norwegian inventor has devised a process to convert the Iceland moss, the nutritive and curative qualities of which are well known, and which is in great demand in Europe, into a succulent and nourishing edible. The lichen, after being thoroughly rinsed, is soaked in a boiling solution, by which means the bitter element is extracted from the plants. After being subjected to this process the moss is submitted to a second rinsing, after which it is ready to be packed.

## A NEW MACHINE FOR ENGRAVING STEEL PLATES.

BY A. FREDERICK COLLINS.

The old and honored art of wood engraving has practically suffered extinction in recent years from competition wrought by the inventions of the half-tone and zinc-etching processes; and the facility, precision, and greatly reduced cost of the latter in reproducing all manner of drawings, photographs, and paintings by adept manipulation have given these substitutes a wide and constantly increasing popularity.

There is another branch of the allied arts that has more successfully resisted the onslaughts of mechanical methods, and this is the engraving of steel plates by hand, yet this too has at last succumbed to the ingenuity of the inventor, and a machine has resulted which is even now working a silent but none the less effective revolution in the most useful of all the industries, namely, printing.

Engraved stationery has been expensive from time immemorial, for the reason that each letter must be cut tediously and with exactness by hand, and an expert engraver cannot produce more than one hundred letters a day; but by means of the new engraving machine shown in the illustrations, a boy can cut upward of three hundred letters per day, and with an accuracy that hand work cannot nearly approach, while the dies thus made do not, as is evident from what has been said, approximate more than a mere fraction of the expense entailed by hand labor.

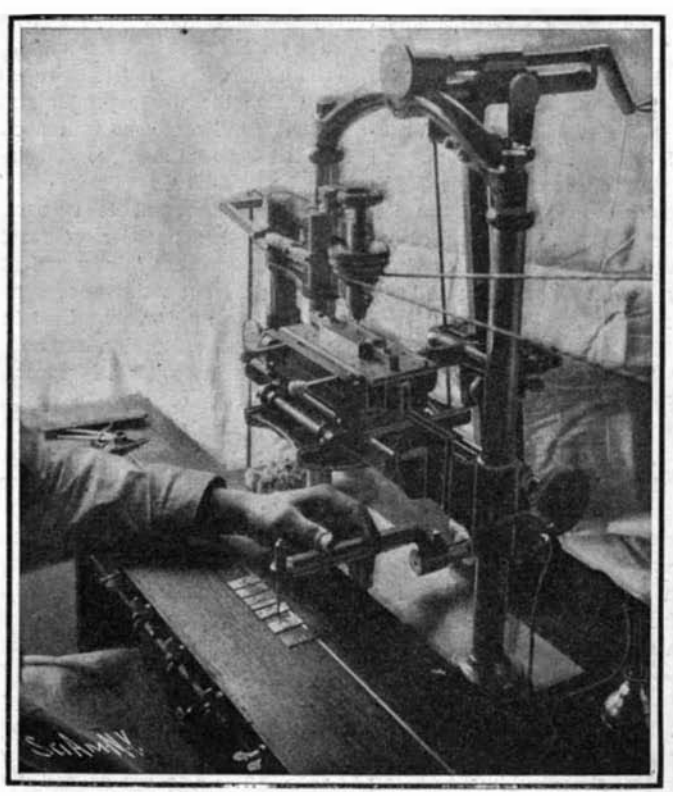
The machine in question, which is the invention of Mr. William S. Eaton, is an excellent example of how persistent and well-directed effort will overcome the greatest obstacles, either by circumvention or elimination, for it has required many years of experiment to reduce it to a commercial form, wherein it would do the work better and cheaper than a skilled engraver, and this together with other improvements has brought the price of engraved stationery almost to the level of common printing.

Before entering into a detailed explanation of the various functional parts of the new engraving machine, it may serve to make the following text clearer by saying at the outset that it embodies the principles of a pantograph and, like that instrument, it makes a copy of a letter or other design either on the same scale or with a reduction or increase in size as desired. With a pantograph the tracing is made by means of a stylus; but in the engraving machine, instead of following a mere line, it traces the original or pattern letter in the form of a groove which has been previously cut, while the reproducing head consists of a routing tool, formed of a revolving steel point, which cuts away and deepens the line on the steel plate with amazing rapidity.

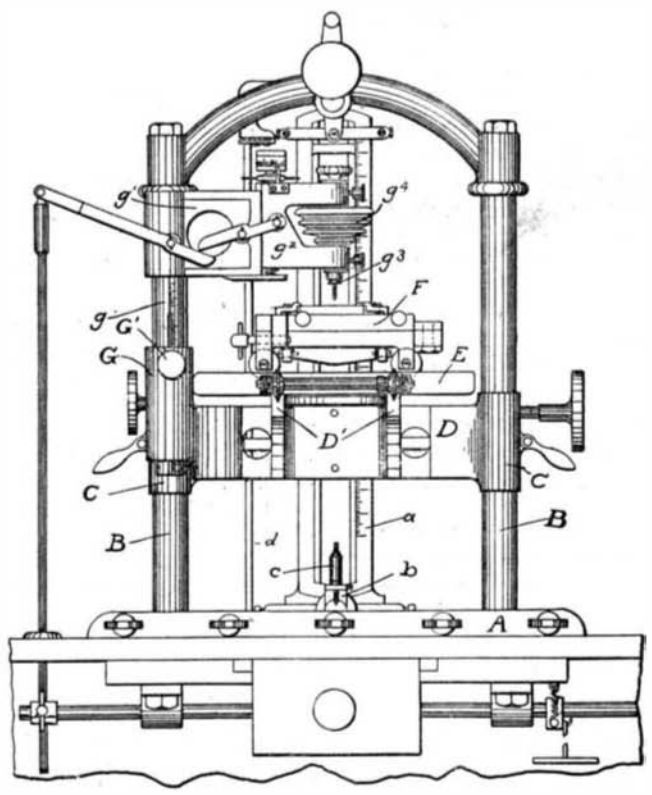
By referring to the photograph, Fig. 1, and the front elevation, Fig. 2, it will be seen that the machine as a whole comprises a table which carries the support, *A*, on which the original or pattern letters are held, and which are to be reproduced on the steel plate. To this table two standards or guides, *B B*, are bolted, while the top is held rigid by an arcuated cross-bar, as a reference to the front elevation shows. On these guides are sleeves, *C C*, provided with lugs, by means of which the former may be clamped to any desired point. The crosshead, *D*, is provided with brackets, the upper faces of which form V ways. Moving lengthwise of the machine in these ways, $D^1$, is a carriage, *E*, supported by beveled wheels. On this carriage rests a frame carrying similar ways, and these are arranged in a horizontal plane parallel to the ways, $D^1$, and perpendicular to them.

A second carriage, having wheels similar to those above described, moves laterally in the ways on the carriage, *E*, and this supports the work-bed of the machine, *F*, to which it is secured by a pivot placed against its surface, this permitting the withdrawal of the work beneath the routing tool for the purpose of inspection. Normally, the bed-plate which holds the steel block to be engraved is maintained upon the carriage by means of a movable stop, while on the surface of the carriage there are adjustable clamps for securely holding the work in position.

Carried by the crosshead, *D*, and integral with it is the guide sleeve, *G*, in which the vertical bar, *g*, is mounted, carrying a support, $g^1$, for the spindle carrier, $g^2$; this is furnished with a rack and pinion, by means of which the carrier may be adjusted vertically independent of the movement of the crosshead, *D*, and the work-bed carried by it. The spindle carrier moves vertically with the ways of the support, and is provided with arms on which is mounted a spindle, $g^3$, having a chuck for holding the routing tool. To this spindle there is attached a stepped pulley, $g^4$, driven by a small electric motor.



The Steel-Plate Engraving Machine, Showing Pattern Letters and the Routing Tool in Position on the Steel Block.




Front Elevation of the Steel-Plate Engraving Machine.

A NEW MACHINE FOR ENGRAVING STEEL PLATES.

(Continued on page 415.)

### A NEW MACHINE FOR ENGRAVING STEEL PLATES.

(*Continued from page 412.*)

Supported by the cross-bar which connects the two standards, *B*, is a screw-feed mechanism and a guide parallel with it. Moving upon this guide, and controlled by the mechanism, is a traveler from which is suspended, by means of a universal bearing, the oscillating transmitter, *a*; the lower end of the transmitter is similarly connected to the arm, *b*, carrying the stylus or tracing tool, *c*, which is adapted to follow the lines of the original or pattern. The transmitter is provided with a central slot, one side being graduated, to facilitate the ready adjustment of the link connecting it with the work-bed, and so enable a speedy regulation of the desired scale of reproduction by the operator. The arm extends toward the operator, and to this is rigidly attached a side arm carrying the tracing point; this side arm is fitted with a ball and socket joint to the lower end of the rod *d*, the upper end of which is similarly fitted in a bracket. The latter comprises a curved arm extending from and carried by the traveler, the object of the rod being to serve in conjunction with the transmitter to keep the arm from turning and to consequently prevent any lateral tilting of the stylus. Mounted on the arm, *b*, is the swiveling frame or pantograph mechanism; it is held in the proper position by a cone bearing, a thrust bearing, and a set-nut, while the opposite sides of this frame are provided with point bearings. Mounted between these bearings, and in alignment with the side-arm, is the lower portion of the transmitter. The upper bearings comprise a frame mounted between point bearings in the traveler, the frame comprising three parallel arms adapted to pass on either side of and through the slot of the transmitter. Between the outside arms of the frame, which also has point bearings, is mounted the upper end of the transmitter; by means of these arms and bearings it will be observed that a universal movement of the transmitter is secured, the motion of which is transferred to the work-bed.

In the operation of the engraving machine, the original or pattern letters are firmly secured to the table beneath the stylus, the arrangement adopted, by which the letters are made interchangeable, being shown in the photograph. Assuming by way of illustration that a letterhead is to be engraved, then the name of the individual or corporation is set up from previously cut letters of large size and clamped to the support. A blank steel plate is then securely attached to the work-bed by means of suitable clamps. Having previously determined on what scale the original or pattern is to be reproduced, the lugs are released and the sleeves are thus permitted to move on the vertical guides; the arm is then swung out, so that the longitudinal adjustment of the transmitter can be made.

The rack-and-pinion mechanism is then actuated to raise or lower the crosshead; the work-bed and the supporting mechanism thereby reduces or increases the scale of reproduction as desired. The transmitter is provided with a scale, so that it can be determined when the correct position of the clamp has been secured. When all the adjustments have been made, the treadle is then pressed and the carrier is pulled downward until the stop comes in contact with the abutment.

To permit the use of the treadle, the screw is reset, and the routing tool having been brought into position so as merely to touch the plate, the treadle is released and the micrometer is set so as to move only with the stop; when the micrometer registers the desired depth of cut, it is held by a set-screw. Everything is now in readiness to proceed with the engraving of the plate. The stylus, as in an ordinary pantograph, is caused to follow precisely the line of the original letters or patterns, while the routing tool reproduces these, cutting them into the steel plate with mathematical precision.

### A Waste Product.

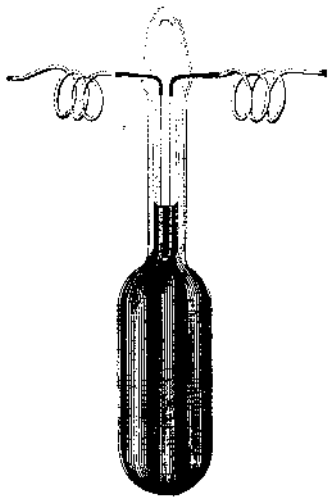
Certain wooden cylinders, usually from 30 inches to 50 inches long, and from 6 inches to 7 inches in diameter, have become quite common in some places in Florida. They are called veneer cores, and are the waste lumber from the cutting of material for the sides of orange boxes and for other crates. This veneering, most of which is pine, is cut by clamping the ends of the sections of the log to spindles, and revolving the logs rapidly under sharp heavy knives. After the bark is off, the knives are sunk into the wood and thin sheets are pared off, unrolling somewhat as paper does from a roll. These are conveyed on runners under drop-knives, which fall at regular intervals and cut the veneer pieces of the right size for the crates. The cores are the heart-pieces that are left after all the log that is available for crate material is cut for veneering. These cores are used for various purposes, to some extent for fence posts, but most of them for fuel, and are found on many Florida woodpiles. There are several veneer-cutting mills in Florida.—Building News.

### A THERMO-ELECTRIC PYROMETER OF LOW RESISTANCE AND COMPENSATOR.

This improved electric device for reading high temperatures has been devised by Prof. William H. Bristol, of Stevens Institute. It is designed for use in all kinds of commercial work. Prof. Bristol states that it is similar in principle to the Le Chatelier pyrometer, but it is of low resistance, and instead of the extremely delicate suspension galvanometer, a Weston special dead-beat milli-voltmeter is used. In place of the costly platinum-rhodium elements, inexpensive alloys are employed for the couples.

The low cost of the couple makes it possible to keep an extra one on hand for use as a standard for quickly and easily checking the one that is in regular service.

The temperature at a number of localities may



THERMO-ELECTRIC COMPENSATOR.

readily be observed on a single instrument, a couple and leads being provided for each locality in connection with a suitable switching device.

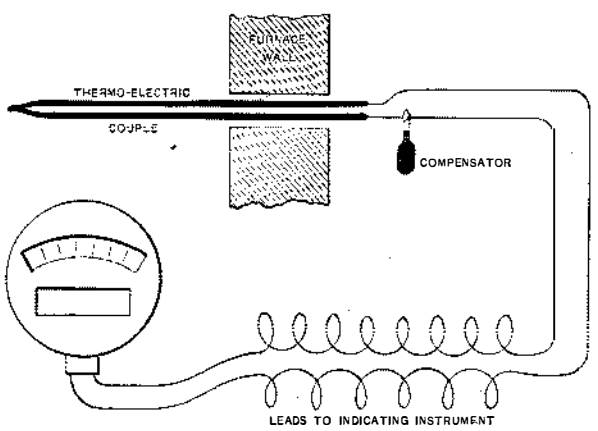
The same instrument may also be provided with scales for different total ranges.

For ranges of temperature up to 2,000 deg. F., instead of using porcelain tubes for insulation, each element of the couple is insulated with asbestos and a carborundum paint. Couples so insulated may be applied directly to the fire space where the temperature is to be measured, or, where extra protection is desirable, the couple may be slipped into a piece of common iron pipe with one end closed. Couples so protected are well adapted for use in liquids and molten baths, such as are employed for hardening and tempering of steel.

For instantaneous determination of the temperatures of molten metals as brass, bronze, etc., the ends of the couple are left disconnected and without insulation.

The same form of the couple may be used for quickly measuring the temperature of a metallic object. For this application the tips of the couple are pointed, so that the temperature at the two points of junction may become the same as that of the object immediately after the contact is made. This form of the couple affords a most convenient method for almost simultaneously measuring the temperature at different points of an object.

When desirable the couples are made with a separable junction, which permits the fire-end to be removed and renewed at pleasure.




THERMO-ELECTRIC PYROMETER, COMPENSATOR, AND VOLTMETER.

A compensator is adapted automatically to correct for atmospheric changes of temperature at the cold ends of the couple.

In order to make an equivalent and to reduce the cost of the platinum-rhodium couple for the measurement of temperatures above the fusing point of the low-priced alloys, a compound couple is formed with platinum-rhodium for the part to be exposed to the full temperature to be measured and of a length extending to a point where the temperature will not exceed 1,200 deg. F. The remaining portion of the elements of the couple is composed of inexpensive alloys.

Automatic continuous records of the indications of the pyrometer may readily be made on a chart sheet which is arranged to move at the proper speed back of the end of the indicating arm. This record sheet is unsupported over its active portion, which is periodically vibrated by the clock movement into contact with the end of the indicating arm and produces a record upon the chart sheet.

The record may be made by ink carried by the indicating arm, or the surface of the record sheet may be coated with some easily removable substance.

For automatically recording rapid changes of temperature a current from an induction coil may be passed through the record sheet from the end of the indicating arm at frequent intervals.

The idea of the pyrometer is, when heated, the generation of a weak current of electricity, which passes through a compensator on its way to the milli-voltmeter also in the circuit, the degree of heat being indicated on the voltmeter. The compensator equalizes what is termed the cool ends of the pyrometer away from the heat, and keeps their potential of resistance equal by the expansion upward or falling, as the case may be, of a column of mercury, which short-circuits the loop of wire passing down through it. The device avoids the need of making allowances for the cool end variations, and is very simple and effectual.

The illustration shows the thermo-couple inserted in a furnace, the position of the compensator and the circuit leading to the voltmeter. The apparatus indicates perfectly the slightest changes of temperature.

### Hollow Concrete Building Blocks.

Single blocks are made as large as 8 feet long, and 8 inches wide, and 10 inches thick, reinforced by steel rods. This tends toward concrete beam construction, though used as lintels. Blocks are rarely made longer than 6 feet without reinforcement. Single-piece hollow blocks are made 20 inches to 32 inches long by 8 inches, 9 inches, and 12 inches, other dimensions, to make the full thickness of the wall. Two-piece blocks are made, as the name implies, for face and back wall. An argument in favor of the single-piece block is that when laid in place a section of the wall is completed, requiring no bonding to the front, containing 30 per cent air space generally; more material and strength, therefore better and more economical than two-piece system. Advocates of two-piece system claim to secure a drier inside wall, with less material, having 50 per cent air space, and present a more even inside wall upon which to plaster.

Following are a few of the proportions of materials used by different makers of blocks:

| | | | | |
|---|---|---|---|---|
| 1 | cement | 4 | sand. | |
| 1 | " | 4 | " | and gravel. |
| 1 | " | 5 | " | |
| 1 | " | 2 | " | 4 cinder. |
| 1 | " | 1 | " | 2 crushed stone. |
| 1 | " | 3 | " | |
| 1 | " | 2 | " | |

Sometimes used as facing blocks, with the view of rendering the blocks more impervious to moisture, but that seems unnecessary, as the concrete becomes practically waterproof when set, thoroughly crystallized. After the materials are mixed dry, water should be added from a sprinkling can till the mass is of a uniform color and sufficiently wet to retain shape when squeezed in the hand. The quantity of water required will vary with the condition of the sand and percentage of humidity in the atmosphere. Shovel the mixture into the mold in small quantities, meanwhile constantly tamping. Remove the block on the pattern to a place under cover, where it shall remain for at least one week (two weeks shows greater strength); sprinkle the block next morning, and twice daily for one week, when the block may be safely used in building.

### Artificial Wood from Peat.

Frequent attempts have been made to use peat as raw material for the manufacture of artificial wood. The material must, for this purpose, be fully reduced to a fibrous condition, so as to produce a fibrous and a mealy mass. This mixture is mixed with an emulsion of 2 parts by measure of plaster of Paris and 10 to 12 of water; and is subjected for considerable time to heavy hydraulic pressure in molds, then artificially dried, polished, and oiled, painted, or varnished.

A more simple process is to wash the peat, without destroying its natural fibrous state, and to mix the resulting moist mass with a mixture of hydrated lime and an aluminium compound (as for instance aluminium sulphate) and press it in molds for a short time in the moist state, after which the resulting plates are allowed to harden in the air. The resultant product needs only a comparatively low pressure, and this for only a short time; and is then set out to dry in the air. The resulting artificial wood is not hygroscopic, and in order to use it for open-air work needs no painting or further impregnation. In view of the fact that the pressing operation takes only a few minutes, considerable quantities can be manufactured in comparatively small space and time.