

in this case of a spiral cam on the driving axle which is capable of rotating the valve actuating cam through a half revolution when moved longitudinally on the axle.

The advantages claimed for this engine are great simplicity in construction, an increased economy in the use of steam, and a consequent saving in fuel, and important saving in the cost of manufacture.

This improved engine is covered by several patents owned by Messrs. Hunt, Halsey & Budington. Further particulars may be obtained by addressing Mr. Thos. G. Budington, 542 Washington avenue, Brooklyn, N. Y.

CHRONOGRAPH FOR ENGINEERING PURPOSES.

BY W. R. ECKART, C. E.

In the chronograph illustrated the tracers, both for recording seconds as well as the velocity curve of the engine, are made of flat strips of spring steel, the axis of each being pivoted at the end on adjustable screw centers to prevent lost motion. By means of a small steel wire and weight extending to the opposite side, the tracers can be made to bear as lightly as desirable on the paper, and when properly adjusted the pressure is only sufficient to remove the lamp-black with which the paper is coated without touching the paper, thereby leaving a fine white line on the dark background with the least possible interruption of motion. The whole is permanently set by dipping the face in shellac.

Instead of using a pendulum for producing (through an electro-magnet) the marks spacing seconds on the paper, some other method that would admit of compactness and portability was found necessary, as the chronograph was to be used not only on the surface where the pumping engines were situated, but had to be adapted to underground use.

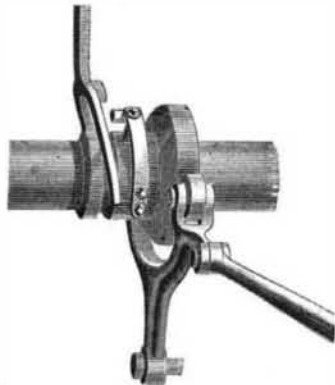
After numerous experiments, the use of a chronoscope (or timer), such as is to be had for timing horse races, was made to give satisfactory results. (See Fig. 1, front page). A stand or base plate upon which the timer was placed had a brass stanchion suspending a fine platinum wire directly over the second hand; this wire, when at rest, bore on a piece of platinum inserted in a rubber insulator projecting from the stanchion, each of these wires being connected through the electro-magnet on the chronograph to a two-cell battery. A circuit was always formed, except when the hand of the timer, revolving once every second, swings the suspended wire free from its metal bearing at the apex of the triangular notch cut in the rubber guide piece; as contact was broken every revolution of the second hand, the armature of the electro-magnet recorded the same by a side movement of the steel tracer resting on the prepared paper of the drum. The suspending wire was made adjustable to suit the second hand, and the instrument was covered with a glass case.

Mr. Briggs states in a paper read before the Franklin Institute that Prof. Hilgard used a chronoscope for the Navy Ordnance Department, in which the second marks were 30 inches apart. I have found no trouble in speeding the revolving drum of 6" diameter, until the second marks were 20 inches apart, but for practical use, a length of three to ten inches (depending somewhat on the engine speed), was all that was desired, and by use of a standard steel scale with the inch divided into hundredths, changes of motion taking place in the one one-thousandth part of a second were easily read and recorded without trouble, and the crossing of lines due to the too frequent revolution of the recording drum during one stroke of the engine was avoided. The use of the small electro-magnet, on the tracer carriage, to raise for an instant the tracing pointer off of the drum at any desired point, was found necessary in determining the effects of elasticity in the interruption and variation of motion, where a long line of pump rods was used, and was also found useful in fixing, positively, the exact point of closing or opening of the steam valves of the engine independent of all reference to the indicator cards taken.

Two drawings giving different views of the chronograph as constructed and used, are attached to this article, exhibiting details of construction to complete what otherwise might be considered a defective description of the instrument.

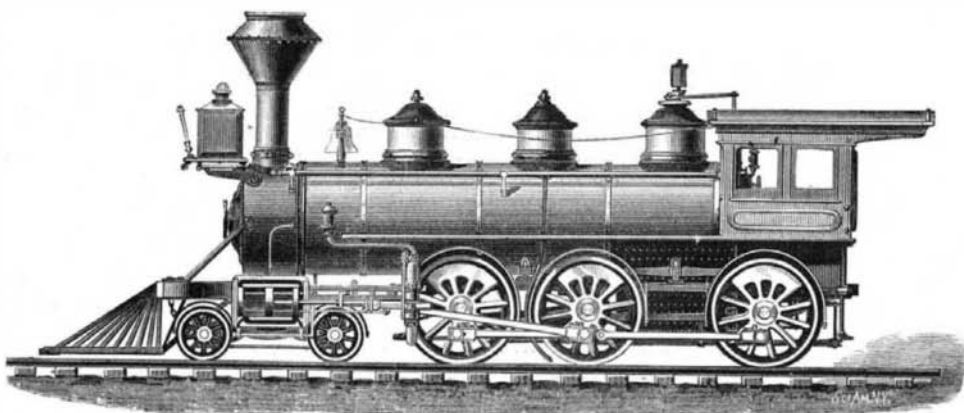
The instrument has been successfully applied to several of the different types of large pumping engines found on the Comstock Lode, such as direct-acting flywheel engines, geared pumping engines, and the "Davy engines;" it has also been used to determine the motion and relative motion of pump rods, and pumps some 2,500 feet below the surface

engine driving same, and at intermediate points. The results are exceedingly interesting and instructive, and as numerous indicator cards were taken from the engines and pumps simultaneously with the motion diagrams, nearly all conditions of motion and power, during the time under consideration, were definitely determined, and may hereafter form the subject of other papers when time will permit.



THE VALVE OPERATING MECHANISM.

Some very important results of the elasticity of long pump rods are clearly set forth in one case: A rod at a point 1,800 feet below the surface showed a positive pause, while the engine driving it was nearly at its point of maximum motion, and pumps attached to the rods may have and do have



HUNT, HALSEY & BUDINGTON'S LOCOMOTIVE.

strokes in excess of or deficient to the stroke of engine driving same, and to an important extent. Hence, I think, it can be definitely stated that any consideration of motion of pumps, or discharge capacity of same, driven by a long line of pump rods based upon the motion or stroke of a surface engine alone, will in no way be even approximate, unless the elasticity and effects of counter-balancing by balance bobs on that elasticity is also considered.

The effects of different degrees of compression upon the engines and motion of the pump rods in passing the centers have been considered, and the diagrams clearly show the importance of considering it in connection with the strength of the rods and balance bobs.

The latest use of the instrument in conjunction with an engine test has been to determine, if possible, the rate of condensation of steam per second, in the steam cylinders of a pumping engine, where the change of motion due to each fractional part of the stroke was determined. Also, a ten

Association applied a chronograph of Morin's type in 1843-4, to the determination of the velocity of piston for a Cornish Pump Engine, I believe there was no application of the instrument to the rods below ground, and, from published records at my command, I am led to believe that this is the first application of a chronograph of sensitive construction ever made to pit work, and the other purposes so briefly mentioned.

DESCRIPTION OF DRAWINGS.—C C, cast iron base plate, covered with sheet brass, upon which the mechanism is secured. B, metal frame containing gearing for driving drum, A, and escapement wheel, b; motion communicated by means of adjustable weights, D. A A, light brass drum, accurately balanced, revolving on friction rollers, s, s, at both ends. f f, parallel guide bars upon which the tracing point, h, and its carriage travel back and forth, receiving motion in one direction from the engine or other moving parts, through the cord, P, passing between the bars, f, and attached to the tracing carriage—the return motion is derived from a coiled spring in the spring drum, C. e e, small electro-magnets on tracing carriage for raising the tracing point, h, off of the paper and replacing it at any desired point to be especially observed. d, electro-magnets on separate carriage, k k, adjustable on parallel bars, f, operating the steel tracing point, g, attached to the armature of d, for the purpose of recording seconds on the margin of the paper or at other parts of same as required. i, chronoscope or watch supported on frame, X, the second hand of which swings the light platinum wire, J, breaking contact with the insulated wire, k, thereby breaking circuit with d, and recording seconds through the tracing point, g, on the paper. g, adjusting screw for the wire, J. a, steel spring of escapement. This spring is securely clamped in Y, its flexibility being controlled to a certain extent by means of the thumb-screws, o and p.

De Lesseps's New Project.

The French Cabinet Council has approved the scheme of M. de Lesseps for cutting a canal through the neck of land dividing the Gulf of Gabes from the salt marshes and low lying parts of the Desert of Sahara to the south of Tunis. It is expected that the sea will in virtue of this cutting once more fill up a considerable portion of the Sahara. The political advantage to be obtained by the scheme if it succeeds will be the insulation of Tunis and Algeria by creating a water barrier between them and Tripoli. The cost of the canal, it is estimated, will be 65,000,000f.

The Denver Mining Exhibition.

The National Mining and Industrial Exhibition to be held in Denver, Colorado, during the months of August, September, and October next, is intended to do for mining and related industries what the cotton fair at Atlanta, last summer, did for the industries there represented. The intention is to exhibit specimens of all the mineral products of this country, and especially the royal minerals, gold and silver, in connection with the machinery used in extracting and milling the ores. In such a manner that visitors may secure at a glance an idea of the vast mineral resources of the continent. It is proposed to collect ores and minerals from every mine

in the United States in such quantities that the exhibits will represent the average character of the mines from which they are taken. Accompanying these are to be charts of the mines, with detailed information of the assay value of the ores, the yields, process of milling, and the geological formation of the ground from which the ore is taken. The exhibits will be classified in States and districts, and each district will have its representative machinery on exhibition, showing the methods of working best adapted to different kinds of ore.

For the purpose of carrying this scheme into effect a company has been formed under the laws of Colorado, with a capital of \$200,000, and of this amount \$100,000 has been subscribed in the city of Denver alone. The company has purchased 40 acres of land in Denver, and a contract has already been made for the construction of a permanent exhibition building. This structure is to be 500 feet long and 316 feet wide, with large galleries and spacious windows, designed after the National Museum at Washington. It is to be constructed of stone, brick, iron, and glass, and the estimated cost is \$135,000. An illustration of the proposed building was given in the SUPPLEMENT last week. The exhibition fund of \$200,000 is now being raised.

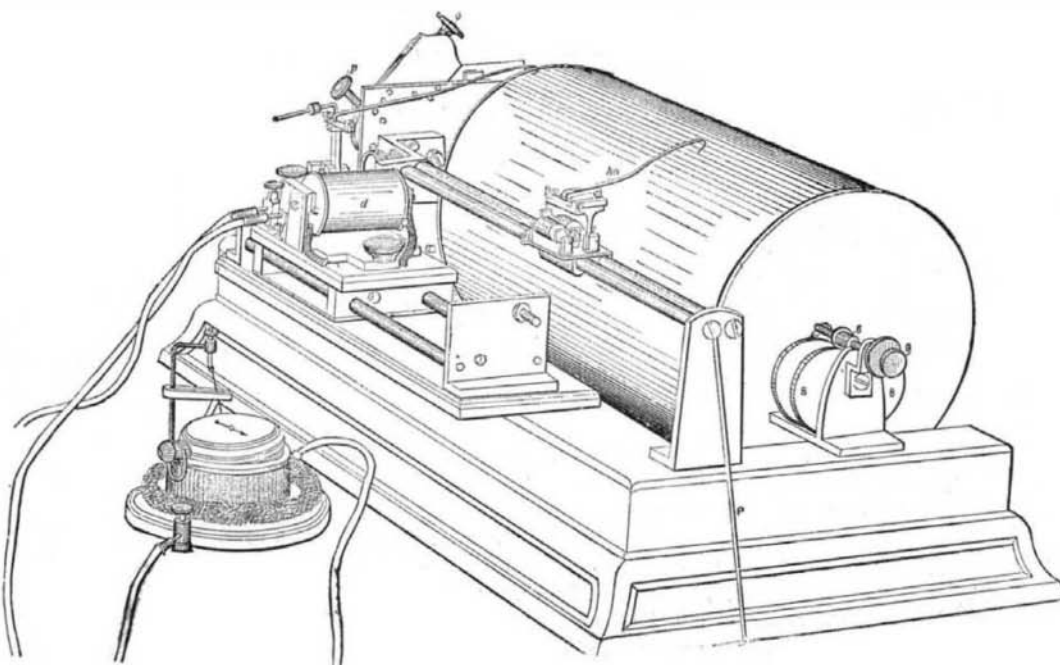


Fig. 2.—CHRONOGRAPH FOR ENGINEERING PURPOSES.

hour experiment trial, to show the economy of compression as compared with a ten-hour trial of the same engine on the succeeding day where no compression was used (otherwise all conditions being similar), has been made, when changes of velocity of piston were determined by the chronograph. While it is well known that a Committee of the British

A Compensating Gas-Pressure Regulator.

M. Ville describes in the *Comptes Rendus* a special form of gas governor invented by himself in consequence of a need arising in the course of a series of experiments. He had in use a chamber in which gas was compressed, but wherein the pressure was liable to diminish by the effect of certain reactions going on inside. It was necessary to provide an arrangement whereby this internal pressure might be maintained constant, by admitting gas automatically from a reservoir at a higher pressure, whenever the pressure in the chamber varied even by a very small amount. For this purpose there was fixed to the chamber a mercury gauge of special form, not illustrated in the communication, but described as containing in one arm gas at a determined pressure, constant for a complete experiment, and communicating with the chamber by the other branch. If a diminution of pressure occurred in the chamber the mercury rose in the tube of the gauge, and came in contact with a needle of nickel-plated steel, isolated in the axis of the tube. By this means a circuit was completed in connection with an electro-magnet. The magnet attracted a lever of soft iron, to which was fixed a valve communicating with the high-pressure reservoir, which being opened, a quantity of gas sufficient to compensate for the reduction of pressure passed into the chamber. The desired pressure being re-established, the electrical communication was broken by the fall of mercury in the gauge, and the reservoir was again shut. M. Ville's apparatus was competent to resist pressures equal to 15 atmospheres, and the magnet was strong enough to control a difference of pressure of two atmospheres on the valve. It was also extremely delicate, the needle being adjusted to one-fourth of a millimeter from the surface of the mercury in the gauge. Consequently a loss of pressure amounting to only this infinitesimal quantity was instantly compensated.

The Caroline Archipelago.

The Caroline Islands have recently been visited by the British war steamer *Emerald*. Her commander, Captain Maxwell, reports his arrival at Strong Island on June 25, 1881. He describes it as mountainous with lofty peaks, some 2,000 feet above sea-level, clothed with verdure to the summits; bread-fruit, bananas, etc., grow in abundance, but cocoa-nuts are far less plentiful than in the low coral islands, and, owing to the bountiful supply of water, they are not much needed. The ancient walls and fortifications on the small island of Lélé, where the king lives, are very extraordinary. The walls are some twenty feet high, having been in former times probably as high everywhere, and twelve feet thick, and are built of enormous basaltic rocks which must have been brought from a distance, and have cost much labor and ingenuity to raise them to their present position. The natives of Strong Island are described as a most gentle, amiable, and intelligent race; they are lighter in complexion than the Marshall islanders. Captain Maxwell afterwards visited Ponafi, or Ascension Island, in the Simavina group, the population of which is stated to be 5,000. This island is divided into several districts, each of which has its own chief. The natives are particularly pleasant and good-looking; Captain Maxwell thinks they have more refined features than any he has seen, but they are not so well dressed or advanced as the inhabitants of Strong Island—the grass petticoat, indeed, seemed to be the principal article of clothing. The island is about fourteen miles square and very beautiful, with lofty peaks from 2,000 feet to nearly 3,000 feet high, which are wooded to their summits, and is surrounded by coral reefs with pretty detached islets; all sorts of fruits and vegetables grow there in abundance. The ruins of residences of former chiefs are numerous and consist of inclosures within inclosures, with walls in some places thirty feet high and upwards of twelve feet thick, built of great basaltic prisms (many of them twelve feet by two feet six inches), laid regularly tier upon tier; each tier being at right angles to the one below, and the interstices filled in with coral and rubble.*

Phosphorescent Rock.

At a recent meeting of the San Francisco Microscopical Society, Mr. H. G. Hanks, State Mineralogist, read the following paper:

Some time since, D. B. Huntley, of the Geological Corps of the Tenth Census of the United States, brought to the State Mining Bureau a mineral, with the statement that it had shown certain peculiarities which led the miners to call it by the rather startling name of "Hell-fire rock."

The property known to mineralogists as phosphorescence is not confined to one mineral species, nor is it very uncommon. But in this specimen it is so strongly marked that there is some excuse for the refusal on the part of some of the miners to work in the mine. When striking their picks into this formation, flashes of light were seen, which they regarded with superstitious alarm.

The locality in detail is Shenandoah mine, Snake Creek district, Wasatch county, Utah.

A chemical examination shows this mineral to be an impure dolomite. It is interesting, not only from its remarkable phosphorescence when rubbed with any hard substance in the dark, but from its beautiful crystalline appearance under the microscope, and the ease with which it can be reduced to a crystalline powder, even by crushing between the fingers.

* Royal Geographical Society Proceedings, February, 1882.

In "Cleveland's Mineralogy" we find it stated that some varieties of dolomite are phosphorescent in the dark, either by friction or when thrown on a shovel which has been allowed to cool just below the point of redness.

The lights being turned down, Mr. Hanks produced the phosphorescence beautifully by scratching the specimen with a knife blade. It was of a bright reddish-yellow or orange color, and it was clearly seen how a miner could be agitated by striking such infernal material in his subterranean walks.

Details of Cost of One Standard Passenger Locomotive Truck—Chicago and Alton Railroad.

| | | |
|-------------------------------------|-----------|----------|
| 1 Truck saddle | 1,175 lb. | \$28 60 |
| 8 Pedestals | 338 " | 6.56 |
| 4 Truck boxes | 512 " | 10.24 |
| 4 Truck box cellars | 72 " | 1.44 |
| 4 Bottom spring pockets | 100 " | 2.00 |
| 2 Top spring pockets | 70 " | 1.40 |
| 4 Oil cups | 7 " | .14 |
| 2 Side bearings | 50 " | 1.00 |
| 4 Axle collars | 80 " | 1.60 |
| 4 30-inch wheels | 1,926 " | 38.52 |
| 2 Steel axles | | 48.76 |
| 1 Swing beam | | 8.10 |
| 2 Swing beam hangers | 48 " | 2.16 |
| 2 Swing beam hanger pins | 6 " | .27 |
| 1 Center pin | 228 " | 4.56 |
| 4 Brasses | 110 " | 22.00 |
| 2 Frames | 380 " | 17.10 |
| 2 Bottom braces | 154 " | 6.93 |
| 4 Equalizers | 400 " | 18.00 |
| 2 Check chains | 16 " | .72 |
| 1 Center pin bolt and key | 13 " | .58 |
| 8 Wheel cover braces | 48 " | 1.60 |
| 4 Springs | | 32.68 |
| 34 bolts | 24 " | 1.53 |
| 4 1-inch bolts | 6 " | .27 |
| 4 3/4-inch bolts 12 1/2 inches long | 6 " | .27 |
| 4 3/4 Axle collar bolts | 8 " | .13 |
| 2 Eye bolts | 4 " | .18 |
| 4 Cellar pins and keys | 6 " | .27 |
| 4 Wheel covers | 52 " | 1.82 |
| 4 Pieces gas pipe | | .11 |
| 44 3/4-inch nuts | | .65 |
| 12 3/4-inch nuts | | .13 |
| 4 1-inch nuts | | .11 |
| 2 Pounds woolen waste | | .24 |
| 1 1/2 Gallon tallow | | .60 |
| Total cost of material | | \$256.17 |
| Blacksmith and machinists' labor | | 75.00 |
| Total cost of truck | | \$331.17 |

Carbon under Pressure.

Some interesting experiments calculated to throw light on the action of the carbon rheostat, relay, and microphone transmitter, have just been made by Prof. S. P. Thompson, of University College, Bristol. With rods of Carré's electric lamp carbon subjected to pressure, and connected in a Wheatstone balance, so that their resistance could be measured either when the contacts with the battery current were of soldered copper or simply touching, he finds that there is no diminution of the internal resistance of the carbon under pressure with the soldered contacts, but a considerable resistance with the touching contacts. It follows that the observed diminution of carbon resistance under pressure is really due to the pressure making the contact between the carbon and the electrodes closer. In short, it is the effect discovered by Professor Hughes, and first explained by him to the Royal Society. Carbon is also said to diminish in resistance with a rise of temperature, but it would be well to test this assertion in the light of Professor Thompson's experiments. If it does, it would, as Professor Ayrton has suggested, seem to be a compound substance, since the elementary metals increase resistance with a rise of temperature.

Effect of Sunlight upon the Draught of Chimneys.

BY PROF. KOHLRAUSCH.

There has been a popular belief that the sun's rays had some influence upon the draught of chimneys, and when complaints were made that a stove would not draw the workman would blame the sunshine. Since Crookes' discovery of the mechanical action of light this supposition no longer seemed so utterly impossible as before, and the author considered it worth his while to make a careful experiment to determine its truth or falsity. The force of the sunlight is of course very slight in the case of the radiometer; but then the same may be said of a chimney, especially when a fire is first started, the counter pressure of the hundred-thousandth of an atmosphere might be critical.

The first thing requisite was a sufficiently delicate apparatus. A thin elastic piece of copper foil, one-twentieth millimeter thick, was bent into waves or corrugated, not concentrically like an aneroid barometer but in parallel straight lines, making waves 15 millimeters long. Such a piece of corrugated foil, 50 mm. (2 inches) high, and 150 mm. (6 inches) wide, was set in a frame, the edges on the short sides were fastened, while the longer ones above and below were free, so they could move one-half millimeter up and down in the frame. It does no harm to have this a little loose, as the open space is infinitesimal as compared with the section of a chimney or the grate of a stove.

A piece of cork is cemented to the foil on its shorter diameter, 20 mm. from the upper edge, in which is stuck a pin so that its head projects. A little mirror was placed vertically with this pin head resting against the back of it near the bottom. The mirror rotated on its horizontal axis, being held by two very fine steel pen points to diminish the friction

to the minimum. When the pressure behind the foil increased it pushed this pin head forward against the mirror and turned it upward, and *vice versa*. The slightest vertical motion could be detected by its reflecting a beam of light as in a galvanometer.

To estimate the sensitiveness of this differential manometer the frame was set in the side of a vessel and a column of air 350 mm. (14 inches) long set in motion by illuminating gas. This caused a motion of the mirror such that an image 3 meters (10 feet) distant moved about 40 mm. Illuminating gas is about half as heavy as air, hence this column of gas equaled one of air only half as long (7 inches), so that the diminution of pressure behind the mirror was only one fifty-thousandth of an atmosphere. Since it is possible to read with the telescope one-half a millimeter accurately, the delicacy of the instrument reaches the one four-millionth of an atmosphere. This is accurate enough for chimneys, since it corresponds to a change of one tenth of a degree in a chimney 5 meters high.

In making the experiments the apparatus was set into the side of a wooden box, which had in the top and bottom a round opening, 80 mm. in diameter, that could be opened and closed. The one at the bottom being closed, the other was exposed alternately to sunshine and shadow. No effect was produced on the pressure in the box. The openings were then fitted with iron pipes, 14 inches long. If one opening was closed the slightest warming of the other pipe would cause an increase or decrease of pressure within, according as the bottom or top was warmed. Yet the sun's rays made no change in the pressure at all. By filling the box with smoke, which slowly emerged from the upper pipe, only negative results were obtained.

From all these and similar experiments it becomes evident that the idea of the sunshine injuring the draught must be consigned to the domain of baseless fables.

A Whitewash that will Stick and Wash.

We find in a German paper a formula for a wash which can be applied to lime walls and afterward become waterproof so as to bear washing. Resenschek, of Munich, mixes together the powder from 3 parts silicious rock (quartz), 3 parts broken marble and sandstone, also 2 parts of burned porcelain clay, with 2 parts freshly slaked lime, still warm. In this way a wash is made which forms a silicate if often wetted, and becomes after a time almost like stone. The four constituents mixed together give the ground color to which any pigment that can be used with lime is added. It is applied quite thickly to the wall or other surface, let dry one day, and the next day frequently covered with water, which makes it waterproof.

This wash can be cleansed with water without losing any of its color; on the contrary, each time it gets harder, so that it can even be brushed, while its porosity makes it look soft. The wash or calcimine can be used for ordinary purposes as well as for the finest painting. A so-called fresco surface can be prepared with it in the dry way.

Axle Telephone.

C. Resio, referring to an arrangement which he laid before the French Academy in 1880, announces that he has contrived a new apparatus which may be applied to any machine by a suitable modification of the transmitter, and by which a single observer, placed at any distance from the machine, may measure the torsion and the angular speed of the motor axle, and, in consequence, the work of the machine. The principle upon which the invention is based is thus announced: If in a circuit containing a battery and a current interruptor capable of giving a sound there are two identical coils, A, A', arranged in tension, the one to the right and the other to the left, the induction currents excited in two other cells (induced), B and B', equal in every respect and connected in tension in a circuit containing a telephone, destroy each other, and in consequence the telephone will be silent if they are equidistant from the inducing coils, A, A', but it will emit a sound if the distances are unequal.

Ice Floes and Polar Bears in the Atlantic.

Incoming vessels continue to report unusual amounts of ice off Newfoundland. The British steamer *Glamorgan*, from Liverpool, April 15, arrived in Boston May 1, and reported that on April 25, in latitude 46° 20', longitude 42° 30', she passed an iceberg fully 500 feet high, on which were polar bears. About four o'clock on the morning of the 26th, while going eleven knots an hour, she ran into a field of pack ice and icebergs. Chief Officer May, who was on duty at the time, reversed the engines and soon got clear. A run of twenty miles was made to the southeast, when the ship was put on her course again. She steamed 160 miles on the southern edge of the icefield, and during that time passed fully one hundred large icebergs, on which were seen polar bears and a large number of seals. Several sailing vessels, names unknown, were sighted icebound, but no wreckage. The steamer was within 500 feet of the largest icebergs, giving a grand view.

Smallpox in Hayti.

An extract from a private letter of the late British Vice-Consul at Port-au-Prince, published in the *Times*, gives a terrible picture of the recent ravages of smallpox in the island of Hayti among a population of less than a million people. It appears that the disease carried off at least 5,000 persons within about three months of its prevalence, and it is calculated that not less than 20,000 persons have perished from it.

American Agriculture vs. English.

Mr. Fowler, M. P. for Cambridge, recently gave to a Chicago *Tribune* reporter his impressions of the agricultural resources of the West, where he has spent some time in making observations. "What has interested me most," said he, "is the matter of transportation to England, in connection with the cost of production there, and the question is whether we can continue much longer to compete with America in the raising of wheat, or even to raise it at all and make it pay. The natural protection to English production, by reason of the cost of carriage, must be—nay, is—rapidly diminishing, and I rather expect, if we were to have a good harvest in Europe and America at the same time, you would have prices such as we have never expected." "The American farmer is producing and transporting wheat and corn so cheaply, then, that his English brother cannot compete with him?" "It is a good deal as a gentleman expressed it to me the other day, when he said: 'A man out here in Iowa is competing with the English farmer just as if he lived in Yorkshire.' That may be a strong way of putting it, but you must observe the great advantages which the American farmer has over the farmer on the other side Iowa land, for instance, costs \$10 an acre, while in England it costs £50, £70, or £80 an acre, so that the Englishman is terribly handicapped at the start, for he has to pay interest on £50 to £70, while the Iowa man pays interest only on £2. Then, in addition to all that, the Iowa man has a better soil and a better climate. In short, with these advantages in favor of the American farmer, with the cost of transportation minimized as it is, so that our natural protection from that cause is rapidly diminishing, I have great doubts whether the cultivation of wheat will pay in England at all. I speak not so much of the present as of the future, for our crop this year has been a good one, while yours seems to have been just the other way. Your deficiency this year, as I have seen it stated, is 80,000,000 bushels—nearly as large as England's entire production in an ordinary season. But here is your vast expanse of territory developing every year. Then, again, you virtually raise wheat in this country by machinery. The extent of your wheat raising territory is simply astounding, but your population, while large in the aggregate, is spread over these vast expanses, and your real market is elsewhere—across the water, over in England, where we find a contrary state of affairs—a comparatively small wheat raising area, with millions of people to be fed. And I don't begrudge you your good fortune in the least. Your prosperity is ours, for, unless our people be cheaply fed, they cannot afford to work for reasonable wages, and unless we can manufacture at reasonable cost, we can no longer hope to supply the world with our manufactured products."

IMPROVED CAR COUPLING.

The engraving shows an improved coupling for the class of railroad cars employing the ordinary link. The design of the coupler is to furnish a means of coupling and detaching cars without the necessity of going between them.

In this device the coupling pin is held in an elevated position, ready for coupling the cars, by an ingenious device, which will be readily understood by reference to the engraving, in which Fig. 1 is a sectional view, and Fig. 2 a perspective view.

A vertically sliding frame, A, is supported by a nib, B, on the forward end of the frame, C. This frame is thrown forward by the springs, a, and carries a pawl, D. Upon opposite sides of the drawhead there are levers, E, for pushing the pawl, D, above the spring catch, b, and behind a lug on the drawhead, F. The vertical frame, A, may be raised by either one of the levers, c, or, from the top of the car, by the chain, d, and one of the levers, E, may be operated by the chain, e, from the top of the car, if desired.

The operation of the coupler is as follows: A link being in one of the openings of the drawhead of the approaching car, and entering one of the three openings in the drawhead, E, the contact of the two heads pushes the drawhead, E, back, carrying the frame, C, with it. The nib, B, being drawn from beneath the frame, A, allows the latter to drop, while the pin supported by it drops through the link.

To uncouple the car one of the levers, c, is pressed down, thereby elevating the frame, A, and withdrawing the pin from the link. The frame is retained in an elevated position by the nib, B.

All that is now required to put the coupling in condition for operation is to raise the pawl, D, by means of the levers, c. This improved coupler is the invention of Mr. F. W. Brooks, of Oak Grove, Dodge county, Wis.

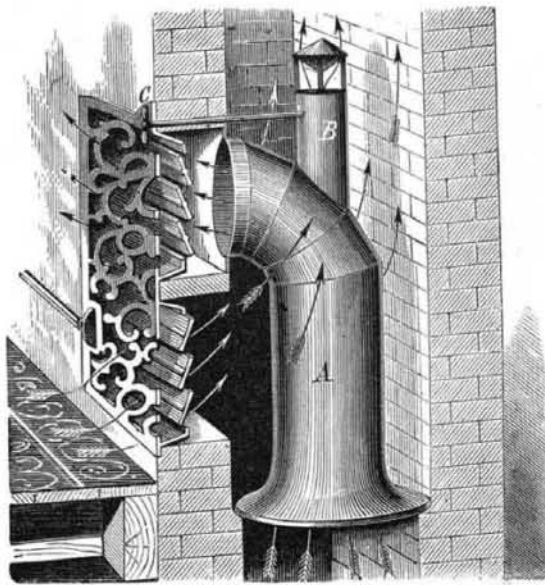
It is one of the most striking illustrations of the power of machinery that cotton can be brought from the far interior of India, on the backs of bullocks, to the sea, shipped around the Cape of Good Hope to England, manufactured, shipped back by the same route, paying repeated commissions and profits, and undersell the native manufacturer on the spot where the raw product is grown, and where labor is considered well paid at fifteen cents a day.—*Senator Bayard.*

BARKER'S HEATING AND VENTILATING APPARATUS.

The recent disclosures made concerning the very defective heating and ventilating arrangements in the public schools and court rooms of this city have, to a considerable degree, aroused the attention of the public, not only in this but in other localities, to the existing necessity of improved and simple means for securing constant supplies of pure fresh warm air in crowded apartments.

We herewith present a device which the inventor thinks is of timely importance, and hence worthy of the careful examination of health boards, architects, builders, and property owners generally.

A supplementary flue, A, flared at its lower end, surmounts the flue leading from the furnace.

**BARKER'S HEATING AND VENTILATING APPARATUS.**

Its upper extremity is curved to terminate in the upper half of a register, through which the hot air is delivered into the room. It will be observed that the register, though having a single grating of the usual size, is divided by a horizontal partition, and each portion is provided with a separate set of slats, either of which may be opened or closed at will. While the hot air from the flue, A, pours into the room in an ascending current, as indicated by the arrows, the cold and heavy vitiated air, which sinks to the floor, makes its exit into the lower half of the register, entering the main flue in the space between the supplementary pipe and the brick work, and thence passing up the chimney. By this means a constant circulation of fresh air is maintained in the room, a candle or handkerchief held before the two portions of the combined register indicating clearly the direction of the ingress and egress currents. By a simple modification the device is adapted for floor registers.

The invention is covered by five patents of recent date.

For further information address the owner, S. M. Barker, Washington, D. C.

A Substitute for Earthenware.

P. Dodé in Paris manufactures tiles, pipes, architectural ornaments, pavements, mantels, etc., from a new material made as follows: Some difficultly fusible stuff like sand, or

into metallic moulds provided with a stamp or piston, which falls as often as the finished article is taken out and fresh material put in, which takes about five or six seconds. The quantity and quality of the glass employed is varied according to the fusibility of the other constituent employed in each case. If very finely pulverized porcelain is employed instead of sand, then the ware obtained will closely resemble porcelain. As the glass is only softened, not entirely melted, it will probably be found possible to combine several colors in a single object and to produce various other curious and novel effects. Nothing is said in regard, however, as to the possibility of decorating the articles before or after pressing, or as to the effect of etching and grinding.

LEAD POISONING IN FACTORIES.—Commenting on a recent fatal case of lead poisoning in an English factory, Dr. William Webb, of Werksworth, Derbyshire, tells the *Lancet* that twenty-five years ago poisoning by lead was of frequent occurrence at the lead smelting works in that part of Derbyshire, and that since that time it has seldom been heard of. He attributes this immunity from poisoning in men constantly exposed to the fumes of lead to the fact that they were advised to partake freely of fat bacon, butter, and other fatty substances, and to drink copiously of lemonade or dilute sulphuric acid in water. The hint was first obtained from Sir Thomas Watson's admirable lectures on the "Practice of Physic."

MISCELLANEOUS INVENTIONS.

Mr. Charles H. Gingham, of Newcastle-upon-Tyne, County of Northumberland, England, has patented a method of cheaply and readily manufacturing incandescent lamps, and a novel method of mounting carbon filaments of electric lamps generally. The method of attaching carbon threads to a tubular holder consists in first dipping the thread ends in a paste formed of a carbonaceous compound and a platinum salt, and then slipping them into the tube, and then holding them in a Bunsen gas flame until the paste is carbonized and the platinum salt is reduced to metallic platinum.

An improvement in pantaloons has been patented by Mr. William Hyams, of New York city. The object of this invention is to make pants durable at the crotch and at the knees. The seat of the pants is made without a seam, and is thus made very strong and durable. It is connected directly with the fly by means of the tongue, so that in bending and stooping the strain will be altogether on the tongue, which is not apt to break off, as it is made integral with the seat—that is, cut out of one piece with the seat. The seams uniting the front and rear pieces at the crotch cannot be ripped or torn by the strain on the seat, as all this strain is taken up by the tongue. The pants are made with double thickness at the knees, and are very durable.

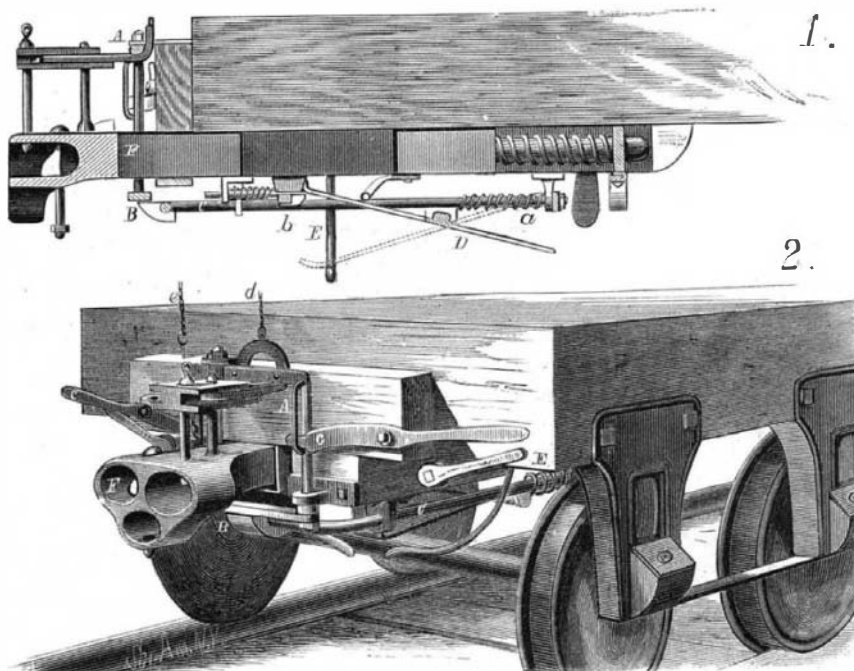
An improvement in bottle stoppers has been patented by Mr. John Q. Houts and Oscar Ericsson, of Sioux Falls, D. T. This invention is an improvement on the bottle stopper for which Letters Patent No. 234,035 were issued to John Q. Houts, November 2, 1880.

Mr. William C. Salmon, of Portland, Ore., has patented an improved mill for pulverizing ores, cements, bones, and other substances. The mill is constructed with a vessel having a central projection on its bottom, forming a ring chamber, a sectional ring die in the bottom of the ring chamber, and screen-covered openings in its sides for the escape of the pulp, and a ring-shaped pulverizer having radial dies upon its lower side, which work on the ring die. The driving mechanism connected with the pulverizer gives it a wobbling movement. Guide blocks attached to the central projection of the vessel insure the centering of the pulverizer.

An improved coiler for railway heads, carding machines, etc., has been patented by Mr. Roger Tatham, of Rochdale, County of Lancaster, England. This invention relates to that class of machines in which two cans are alternately presented to the carding machines to receive the sliver or other material as it is delivered therefrom, and when brought into proper position to receive such sliver are revolved. The invention consists in the construction of two trains of mechanism, one consisting of cog wheels and the other of cog, bevel, and worm wheels, worms, a tappet pin, and a stud, both trains actuated by the same driving shaft, whereby the cans attached to the coils are simultaneously rotated and delivered.

Mr. Henry Hager, of Elizabeth, N. J., has patented an improved machine for drilling two holes simultaneously at variable distances from each other. The invention consists in a drilling machine constructed with a fixed drill shaft and with a circularly movable drill shaft.

The London *Builder* attributes the marvelous durability of mortar in Italy to the fact that the lime remains in a pit covered with water for two years before it is used, whereas in England lime is slaked and used the same day. Most building specifications even require newly slaked lime.

**BROOKS' CAR COUPLING.**

pulverized porcelain, is mixed with powdered glass and a little water. The mass is then made into balls or plates, and heated until the glass softens, when it is pressed into the desired shape and cooled. For the mixture 100 lb. of very finely pulverized glass is mixed with 500 lb. of sand, and some metallic oxide added to impart the desired color; it is very thoroughly incorporated with the aid of a little water to make it plastic. The slabs or balls formed from it are placed on plates of refractory clay, and run into a furnace provided with little trucks like the tempering furnaces of a glass house. When the glass is softened the balls are put