Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, JULY 8, 1882.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 340,

For the Week ending July 8, 1882.

Price 10 cents. For sale by all newsdealers.

THE SLAUGHTER OF RAILWAY MEN.

At the recent meeting of the Master Carbuilders' Association, Mr. Forney said that from 1,200 to 1,500 railroad employes are killed, and from 5,000 to 10,000 injured, every year.

Curiously the railway train is most dangerous before it leaves the yard, the hazards of the road being slight compared with those of the station.

In his address President Garay said that the present defective and expensive devices for coupling freight cars have been in use for many years without any marked improvement upon the old link and pin system. Although thousands of patents have been granted for improved draw bars and automatic couplers, many of them with some merit, yet none have sufficient advantages to place them in general use.

Though most of the injuries to train men while coupling cars were, he believed, the result of carelessness on their part, it was none the less important that some means should be devised and adopted which would prevent the present risk to life and limb in the making up of trains. What was wanted was an automatic coupler, dispensing with the use of loose links and pins, and at the same time admitting of their use when needed.

The committee on automatic couplers and drawbars reported that out of the 3,000 patents issued for devices of this sort they were unable to select and recommend one as a standard. The implication was that though some of the inventions were good there was none that satisfactorily met all the requirements of the case.

Whoever will watch the making up of trains in any large and busy yard will soon see abundant occasion to charge the yard-men with recklessness. It would be a harder task to discover how, under existing conditions, the work could be done without a constant running of risks that to a cautious onlooker would seem little less than foolhardy. So long as men have to go between cars to couple them they must be reckless—as a soldier is "reckless" who, in the discharge of his duty, exposes his person to the shots of the enemy. It is a problem for inventors to solve to furnish the means for obviating this great hazard to yard-men; and it is the business of railway officials to promptly put to practical test every device that seems reasonably well calculated to cure the evil.

Battles which have decided the fate of empires have been lost and won at a smaller cost in life and limb than that reported by Mr. Forney.

The urgent need of a better state of things has already made itself felt in legislative assemblies, and inventors may rest assured that the railway companies will not long be allowed to overlook or reject any device which shall meet the requirements of the case, even if they should be disposed to do so. The slaughter is too great to be tolerated in the face of a reasonable prospect of cure.

It is needless to add—what must be apparent to the dullest—that the patent for a successful coupler and drawbar would be an exceedingly valuable property.

EMPLOYMENT FOR THE IDLE.

The appearance of Sir John Lubbock's book on "Ants, Bees, and Wasps," suggests the query why books of this character are so rarely produced by our fellow-countrymen. Lubbock devoted ten years or more to the accumulation of the facts that make the book so valuable. It cannot be that Americans are so deficient in the powers of observation that none can be found competent to watch "the busy bee improve each shining hour," and gather facts sweeter than their honey from every tiny insect. It is generally said that we are too busy and that it "don't pay." Are we too busy for polo, and do intercollegiate boat races pay? It is too true that scientific investigation is dependent upon wealth. Had Lubbock been a poor man, compelled to earn his daily bread, he could not have given his days and his nights to the study of ants, simple and inexpensive as were his apparatus and materials. Much may be learned of the habits of birds or insects by an occasional glance at them in spare hours, but study, to be of scientific value, must be close and persistent, to the exclusion of many other things. Few who are competent feel that they can afford this. Among the hundreds that go forth annually from our scientific schools there must be a few endowed with talents for observation, but more lucrative positions await them. The average "graduate" counts his time worth at least $1,000 the first year, $1,200 the next, and so on. Is he wrong in doing so? He has devoted the four best years of his youth to it, he has expended a large sum of money, he has exhausted his own inheritance, and is, perhaps, in debt for his education. Such is the condition in which many a scientific graduate finds himself at the moment of taking his degree. He really *can't afford* to devote himself to unprofitable work—unprofitable from a money point of view. He is not yet a Lubbock or a Darwin. He must serve a long apprenticeship, retracing old and well-worn paths, before he is able to explore a new one. Too rarely has his power of observation been cultivated while under the care of instructors, who have had to content themselves with cooking mental pabulum and setting it before the hungry students, who bolt it, unmasticated, into their overloaded heads (more often merely into their note books), and who go forth from the halls of learning praising the skill of their cooks, and unaware that they are foreordained victims of mental dyspepsia.

Fortunately our Government, like many others, is opening the door for a few real students, whether college men or not, to pursue their bent by giving them a sort of apprenticeship. Accompanying King, or Gilbert, or other explorers of Western wilds, are young men who are having their wits sharpened and their powers of observation trained in a rough but practical school. Their expenses are paid, and they have no care but to do their whole duty.

But there are other fields of study nearer home, fields that the Government cannot undertake to cultivate, the insect world being one of the most fascinating. Who will essay to do for our country, and for some of our insects, what Lubbock has done for ants abroad? The field is not exhausted, and no domain is barren if properly cultivated. We have a wealthy, idle class, less idle than the English it is true, but men who have no need to labor with hand or head, and who are free from every care. To-day hundreds of young men are scouring the forests of the Adirondacks, or shooting the rapids of the St. Lawrence, not in search of "one impulse from the vernal wood," but impelled by fashion, and boring themselves to death because it is "quite the thing you know" to rusticate. Here is the material from which the ranks of unpaid investigators ought to be recruited. Does not Lubbock write M.P. and Bart. and other significant letters after his name? Where is the M. C. that has done as much, and which brings him the more credit and renown, his services in Parliament or his labors among the ant hills? Is investigation likely to lower the dignity of the son of a millionaire?

We have pointed to this as a waste of valuable raw material; men of brains, of leisure, and of means, seeking in vain for some new way of getting rid of the most valuable thing on earth—time. But they are of no use to us or to science; let them finish their days as they have begun, let them listen to a few law lectures that they do not understand, or join some political party and set up for statesmen if they have money enough to buy an office. But shall this thing go on for ever? Is it not possible to cut off, in part at least, the source of supply by turning it to other channels? Many of these young men who have now no thought beyond the morrow, no higher ambition than to color a meerschaum, were boys once, real, genuine, inquisitive boys. Then their powers of observation were capable of cultivation, then a love of nature could have been implanted in their souls, and life would have been brightened by an object, and one worthy of a life-long pursuit. When teachers cease to hold up as models those great men who, like Lincoln and Garfield, have risen from poverty and obscurity to the presidency, and point with pride to the boys who, in spite of wealth and luxury, have had the courage and perseverance to do a noble act by devoting their time, money, and talents (for some rich boys have genius as well as poor ones) to the study of nature, when teachers begin to have common sense, we may hope to see some of this valuable material rescued from its present *downward* course. Rich men are not all fools, and there are some who would take pride in a son who, although he might not be a Leidy or a Lubbock, a Darwin or a Dawson, should be able to associate on terms of scientific equality with men of that class.

Unfortunately few schools exist, probably none, where the nature-loving boy can go that he is not in danger of having that faint spark crushed out of his young soul by the memorizing and cramming process that the marking and grading system necessitates, so that, having studied nature in books, when they go out to look for her they do not recognize her. When and where shall this lack be supplied?

Certainly it may be said that nature is spreading a bountiful harvest, but the laborers are few. Let those who have time, money, and brains, lend a hand, feeble though it may be, in unlocking the secrets of nature.

Curious Electrical Phenomena on Pike's Peak.

Sergeant L. M. Dey, signal officer at the summit of Pike's Peak, writes: "At 8.45 o'clock this evening, on opening the door, a most curious phenomenon met my astonished eyes. The line on the summit was distinctly outlined in brilliant light, which was thrown out from the wire in beautiful scintillations. On near approach to the wire these little jets of flame could be plainly observed. They presented the appearance of little electrified brushes or inverted cones of light—or more properly little funnels of light with their points to the line, from which they issued in little streams about the size of a pencil lead, and of the brightest violet color, while the cone of rays was of a brilliant rose-white color.

"These little funnels of light pointed from the line in all directions and were constantly jumping from point to point. There was no heat to the light, though it was impossible to touch one of these little flames, for as soon as they were approached by the finger they would instantly vanish or jump to another point on the line. Passing along the line with finger extended, these little jets of flame were successively 'puffed out,' so to speak, to be instantly relighted in the rear. It was a curious and wonderful sight. No sensation was experienced on applying the tongue to the line. Not only was the wire outlined in this manner, but every exposed metallic point or surface was similarly tipped or covered. The cups of the anemometer, which were revolving rapidly, appeared as one solid ring of fire, from which issued a loud, rushing, and hissing noise. The wind vane represented a flaming arrow, and a small, round, wooden stake—stuck up in the snow to show the position of the gauge—was similarly tipped, as well as an angle of our stone chimney.

"In placing my hands close over the revolving cups of the anemometer—where the electrical excitement was abundant—

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not the slightest sensation of heat was discovered, but my hands instantly became aflame. On raising them and spreading my fingers, each of them became tipped with one or more beautiful cones of light, nearly three inches in length. The flames issued from my fingers with a rushing noise, similar to that produced by blowing briskly against the end of the finger when placed lightly against the lips, accompanied by a crackling sound. There was a feeling as of a current of vapor escaping, with a slight tingling sensation. The wristband of my woolen shirt, as soon as it became dampened, formed a fiery ring around my arm, while my moustache was lighted up so as to make a veritable lantern of my face. The phenomenon was preceded by lightning and thunder, and was accompanied by a dense driving snow, and disappeared suddenly at 8:55 o'clock, simultaneously with the cessation of the snow. I much regret that there was no one on the Peak to witness the phenomenon with me—it was a wondrously beautiful sight."—*Colorado Springs Republican.*

Remarkable Tornado.

On the 17th day of June, 1882, between the hours of 8 and 9 o'clock P.M., a terribly destructive tornado (or, in more modern parlance, "cyclone") passed from the northwest to the southeast, through a portion of the State of Iowa. We hear of its first movements in the County of Boone, from whence it passed through a portion of the counties of Story, Jasper, Poweshiek, Keokuk, Jefferson, and Henry. It was not only very erratic in its course, but was sometimes divided into two or more branches, which spread a few rods or a few miles apart, only to reunite with redoubled fury at some other point in the line of its course. It did not always visit the earth's surface, but often passed so far above as to inflict no injury, and again would swoop down with relentless fury, carrying death and destruction for a few miles to every animate and inanimate object in its path. It did not move in straigbt lines. It not only pursued a zigzag course, but also moved upward and downward, and had a circular as well as forward motion at the same time.

The point of its greatest devastation was the city of Grinnell, in Poweshiek County. Malcom, a village of some 300 inhabitants, nine miles southeast of this city, was also nearly destroyed, but with small loss of life.

For a few days previous to the storm the temperature was so low as to excite surprise throughout the State, the mercury varying from 40° to 48° Fahrenheit during the day, and still lower at night. At Grinnell, on Saturday morning, the 17th, the temperature rose rapidly, and at 2 o'clock P.M. the mercury marked 98° in the shade. The air was oppressive and stifling, notwithstanding a gentle breeze was perceptible. After 4 o'clock clouds began to overspread the firmament, presenting a most singular appearance and attracting much attention. They may be described as small in size, light and fleecy in appearance, quite detached from each other in many places, having small dark pendants suspended from their lower portion, and with but slight movement in any direction. Shortly after 6 o'clock dark storm-clouds were seen in the western horizon moving slowly upward toward the zenith, and about which brilliant flashes of lightning played from time to time. The low rumble of distant tbunder reached the ear, while directly overhead the small conical-shaped clouds, which had now assumed a still darker appearance, were seen to be in motion and massing themselves together as if for battle. At about 8 o'clock our attention was called to a most singular appearance of the sky a little south of west from Grinnell. It can be best described as like the reflection from the setting sun, yet in this instance such could not have been the case, as it had not only disappeared below the horizon thirty minutes before, but the position of the phenomenon and tbe mass of dark clouds beyond would render such reflection impossible. It appeared to tbe eye about ten feet in diameter, circumference irregular, and of a rich yellow hue, partly inclining to red, and emitted a light that was brilliantly reflected through the windows. Its unearthly appearance at such a time created some alarm in many localities. Within the following twenty minutes heavy rain, accompanied by a most weird electric display, heavy peals of thunder, and dense darkness (except when relieved by the lightning), threw tbe pall of night over every object. The wind, which at first was a gentle breeze, increased to a gale, swaying the trees in every direction. Hail about the size of a pea, and a few weighing one-fourth of an ounce, fell rapidly, but doing little damage.

At twenty minutes to 9 o'clock the dreadful roar that preceded the coming of the destroyer was plainly heard in the northwest. At first a low, sullen roar like Niagara in the distance—then deeper-toned, louder, and faster, as of many approaching railway trains—still nearer, mingled with an awful, never-to-be-forgotten hum, as of wheels and pulleys in motion, until the listener, with blanched face, fled in terror for a place of safety. Hundreds sought refuge in cellars and caves, and were thus saved from death, *one only* being killed who had taken this precaution. The point of observation of your correspondent was about 900 feet from the line of the greatest destruction in Grinnell.

The inky darkness of the hour shut out from human eye the scenes of anguish and the greater part of the appalling work of destruction, in which the elements were engaged, yet one or two buildings nearly entire, were seen high in the air for an instant as the vivid flashes illumined the awful scene.

The storm-cloud proper entered the city from the southwest, first striking the earth on the north side of the C. R. I. and P. R. R. This terrible "reaper of death" cut a swath through densely populated portion 700 feet in width in the average, and did not probably exceed five minutes in passing through the city, but in that limit of time forty human beings were instantly killed, and at least ten more will die of their injuries. From fifty to sixty buildings (the Iowa College buildings included) were also totally destroyed—in most instances broken into small fragments and thrown in all directions.

Two heavy freight trains, entering the city from the north and east, were caught up and dashed upon both sides of the track with terrible violence. Even the ponderous engine was lifted bodily upward, but came down upon its wheels again without injury. The distance traversed by this tornado from Boone to Henry County is in a direct line about 145 miles, although its circuitous route was probably 200.

It appears to have been between three and four hours in travelling this distance, and caused the death of seventy-five or eighty people, a still greater number of animals, and destroying property valued at nearly two millions of dollars.

Several peculiarities of this tornado may be worthy of record. Water, in immense volume, accompanied it. Electricity in form dynamic and thermal played an important part. Balls of electricity were frequently seen, and window-glass was melted in circular form and with sharply defined borders. Light objects were carried upward, apparently to a great height, and thence at almost right angles with the course of the tempest, found on the ground thirty and forty miles distant.

Unlike the tornado of 1860 in this State, no fetid or sulphurous smell was perceptible, nor did the dead bodies present such a blackened appearance, and wounds seemed to heal more rapidly. There seems to have been a series of almost constant rain and wind storms in this State, and as far south as Missouri and Kansas, since the 17th and up to the date of this communication.

FRANK A. HOWIG.

Grinnell, Iowa, June 26, 1882.

Remarkable Wave on Lake Erie.

The southern shore of Lake Erie was struck by a remarkable wave on the morning of June 23. Much damage was done at Cleveland. The signal officer at that point heard distant thunder at 6:10, and looking northward over the lake saw a heavy thundercloud overhanging the water. Above it was a contorted, angry looking conglomeration of clouds, and north of it a large stratus cloud. It moved very rapidly, and at 6:20 A.M. the wave struck the shore. When first noticed the wave was about a quarter of a mile from shore, and appeared like a green wall ten feet high. The lake had been calm, and this was the first disturbance of its surface. The wave swept along rapidly and silently until it reached shallow water, when it made a loud, swashing noise, and broke on the shore with a great roar. The wave reached from north-north-east to south-south-west. After it had struck the shore two recoil waves followed close together. At 6:35 A.M., a quarter of an hour after the wave had reached the shore, a shower began, which lasted for fifteen minutes, during which two one-hundredths of an inch of rain fell. No high wind was perceptible, although slight squalls on the lake were reported by incoming vessels.

Gold and Silver Plated Flowers and Insects.

At a recent meeting of the Physical Society, Berlin, Prof. Christiani exhibited as samples of a new method of preservation a series of organic bodies coated galvanoplastically. A mulberry leaf, a crab, a butterfly, a beetle, the brain of a rabbit, a rose-bud, and other objects, were plated with silver, gold, or copper, and showed all details of their outer form, down to the finest shadings. As to the process, it was stated that the objects to be preserved being put into a solution of silver nitrate in alcohol, then dried and treated with sulphureted and phosphureted hydrogen, form good conductors, which, brought in the usual way into the galvanoplastic bath, can be coated with any desired thickness of a metallic deposit.

Magazine Guns.

The Magazine Gun Board now in session at the Armory Building, New York, have decided not to receive any models of guns for examination test after July 15, at which time the supplementary tests of the guns already received will begin, and tbe real work of selecting one or more guns for trial in the service will be inaugurated. It is understood, says the *Army and Navy Journal*, that thirty-three different models have been tested by the board, and there are five or six more still on the dock, and there seems to be a fair prospect of getting a good arm for the service. The board, as the result of their experiments, have, we understand, reached the conclusion that a carbine cartridge, with 50 grains of powder, will shoot a bullet farther than a cartridge with 70 grains of powder.

THE marvelous durability of mortar in Italy is attributed by the London *Builder* 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.

Ten Years' Agricultural Progress.

A special census statement contains the following agricultural aggregates: The value of the products of agriculture had not been computed, nor tbe value of tbe hay crop for 1879 (the census year's crop). The wool statement does not include that grown on public lands and ranches, nor that in hands of butchers, etc., 100,000,000 pounds.

	1880.	1870.
Land in farms in acres	539,351,713	407,735,041
Improved land in acres	287,220,321	188,921,099
Value of farms	$10,197,161,905	$9,262,803,861
" farm implements	$406,522,414	$336,878,429
" farm animals	$1,500,503,807	$1,535,276,457
" farm products	...	$2,447,538,658
Horses	10,357,981	7,145,370
Mules and asses	1,812,982	1,125,415
Working oxen	993,970	1,319,271
Milch cows	12,443,593	8,935,332
Other cattle	22,488,590	13,566,005
Sheep	35,191,656	28,477,951
Swine	47,683,951	25,134,569
Corn in bushels	1,754,861,535	760,944,549
Wheat "	459,479,50	287,745,626
Oats "	407,858,999	282,107,157
Rye "	19,831,595	16,918,795
Barley "	44,113,495	29,761,305
Buckwheat "	11,817,327	9,821,721
Cotton in bales	5,746,414	3,011,996
Hay in tons	...	27,316,048
Wool in pounds	155,685,750	100,102,387
Butter "	777,204,471	514,092,683

No Atmosphere in the Moon.

At a recent meeting of the Photographic Society of France, M. Janssen handed round a magnificent proof of the late partial eclipse, and said a few words upon the long discussed question of a lunar atmosphere. In speaking upon this subject he said: "Suppose for a moment that the moon is surrounded by an atmosphere, what would be tbe result if we took a photographic view of it during an eclipse? The lunar disk would be sharp enough, but there would be a gradual decline in density, as in a vignetted portrait. This is exactly the contrary which took place, as the proof will show. The lunar disk is very sharp, and the negative is rather intensified near the disk, probably from refracted light." M. Janssen appears to doubt the existence of a lunar atmosphere.

Steam on Street Cars.

After the most faithful efforts of the managers of the street cars in Paris to substitute steam power for horses, they have given up the job. For five years they have used steam, during which period they tried twenty-one different forms of engines. The companies now discard steam and return to horse flesh as on the whole the safest, most economical, and most satisfactory. It would seem as if the experience ought to be of value to inventors; that they can and will ultimately overcome every difficulty there can be no doubt. Who will win the prize by the invention of a steam street car that will successfully compete with animals?

The Growth of Coral.

After a cruise of a few months in the South Pacific, a French man-of-war was recently found to have specimens of living coral growing upon her hull. This interesting discovery has thrown some light on the question of the rapidity of growth of coals. The evidence tends to show that the vessel on passing a reef of the Gambier Islands, against which it rubbed, had picked up a young fungia, which adhered to the sheathing of the ship, and grew to the size and weight it had when observed, a diameter of 9 inches, and a weight of 2½ pounds, in nine weeks.

Bean Disease.

The early French beans in Algeria have been extensively affected this year by a disease unknown before, at least in these crops. It attacks stems, branches, leaf stalks, and fruits; which acquire a white covering, in some parts like tufts of wadding, this being the mycelium of a parasite fungus, which also deeply invades the bark, and sometimes penetrates to the pith. M. Prillieux finds some evidence that the same disease attacks other plants of very different nature—as clover and hemp.

Over 400 Miles a Day.

The Guion steamer Alaska has again beaten her best westward record. She left Liverpool June 17, and Queenstown at noon the next day. She arrived at Sandy Hook at 9:45 on the morning of the 25th, her corrected time for the run being 7 days 1 hour 50 minutes. On the 22d the distance run was 430 miles. The average for the trip was over 400 miles a day.

The Carrying Capacity of Freight Cars.

It is only a few years since freight cars were allowed to be loaded with more than ten tons. Now but few eight-wheel cars are built with a carrying capacity of less than twenty tons. The advantages and economies secured by increased capacity are such that a committee of the master car builders' association have recommended the building of twenty-five or thirty ton test cars, believing that freight can be carried in thirty ton cars with as much safety and with greater economy than in cars of less capacity.

To stain a glass lamp chimney paint the glass with a solution of waterglass (sirupy) stained with chrome green, and let it dry thoroughly before using on the lamp.

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Migration of Fish.

Dr. Keller, in a communication sent to the Swiss Geographical Society, from Suez, gives some interesting points on this subject. In the twelve years that have elapsed since the opening of the Suez Canal, the interchange of animal life between the Mediterranean Sea and the Indian Ocean has not reached the dimensions at first anticipated, still a number of smaller fish have found their way from the Mediterranean to the Red Sea. A greater desire to travel in this direction than in the opposite one seems to prevail. A very interesting fact has, however, been established, namely, that the real pearl oyster are traveling through the canal, not a few straggling outposts, but large trains moving regularly along. As they have not yet reached the Timsah lake, it will be one or two decades before they will be established in the Mediterranean.

THE BINARY INJECTOR.

The accompanying engraving illustrates a somewhat curious injector made by Messrs. Weild & Co., Gorebrook Ironworks, Longsight, Manchester. It was for a long time a puzzle how an injector working under a given pressure could force water into a boiler in which there was a still greater pressure, but the Binary injector does more than this, for the exhaust steam from an engine is made use of to feed the boiler with water.

The section which we give will make the interior of the instrument intelligible. The theory of the action of the injector we give as stated by Messrs. Weild. The injector is not perceptibly intermittent in its action, although the exhaust from the engine comes in puffs. The pressure of the steam cannot be less than about 18 lb. absolute, and this, coming in contact with the feed, is condensed, and the velocity of influx of the steam to the injector is thus very high.

Between the blasts or puffs the reciprocation of the piston expels the residual steam or vapor, which must, in the cylinder of a non-condensing engine open to the exhaust, necessarily equal the atmospheric tension. The continual supply and condensation of such steam provides, without intermission, a propulsive energy sufficient to introduce the feed-water under ordinary pressures, as we conceive the following rough calculation will tend to show. Friction neglected, steam of 14·7 lb. per square inch, or 2,118·4 lb. per square foot, absolute pressure, will flow into a vacuum of 10 lb. per square inch below the atmosphere, which corresponds to an absolute pressure of 4·7 lb. per square inch, or 676·8 lb. per square foot, with a velocity

$$=8\sqrt{\frac{2118\cdot4-676\cdot8}{0\cdot0378}}$$

$=1{,}554\cdot8$ ft. per sec.

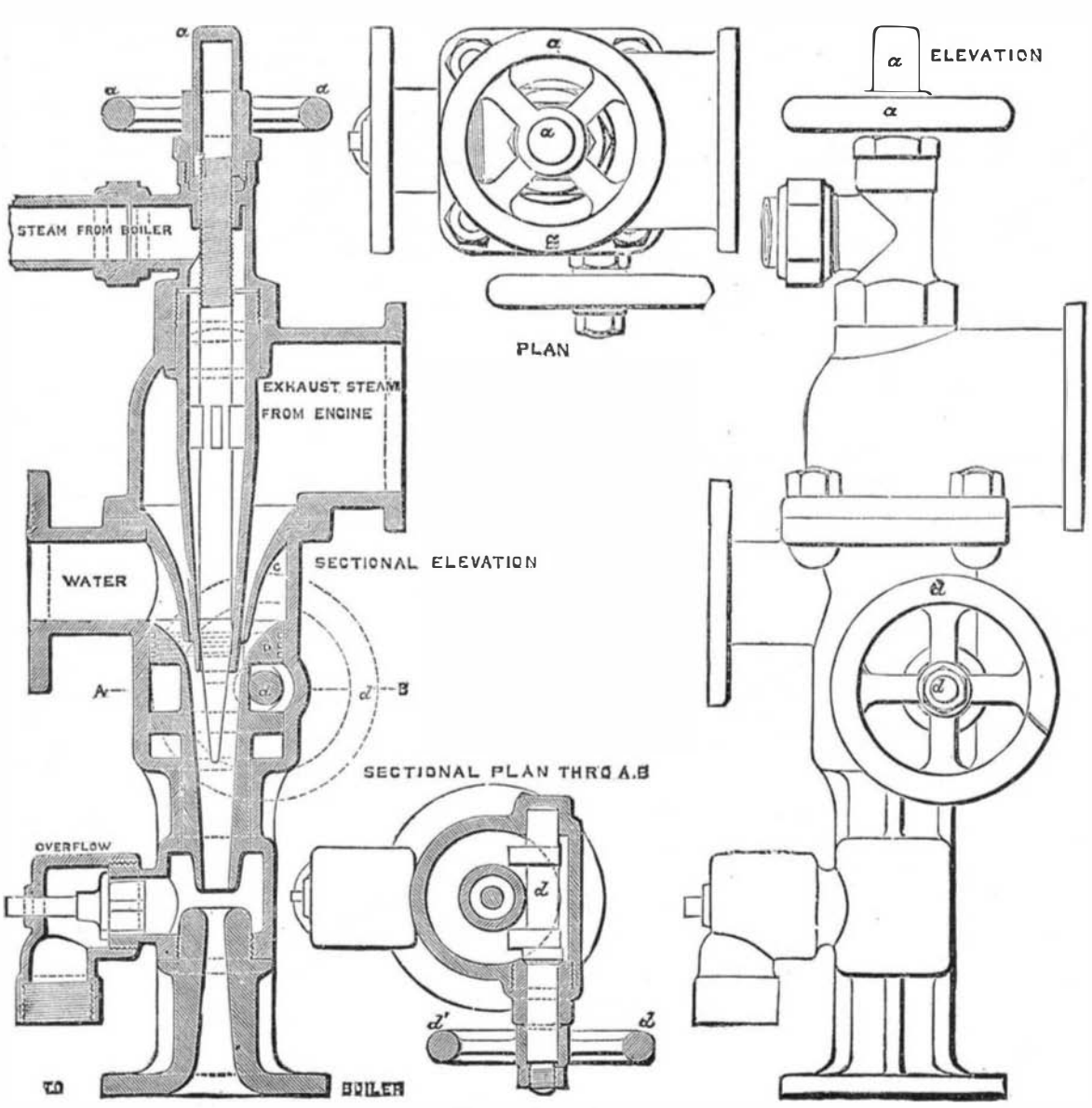
The head of water requisite to balance a pressure of 75 lb. per square inch above atmosphere

$=75\times2\cdot25=169$ ft.

nearly. Velocity of efflux under such head

$=8\sqrt{169}=104$ ft.

per sec. Suppose each pound weight of steam of atmospheric tension propels 12 lb. of water and is thereby condensed, the equivalent resultant velocity will be $\frac{1{,}554\cdot8}{113}=119$ ft. per sec.; this is equal to a head of 219 ft., or a pressure of 97·5 lb. per square inch. If the original temperature of the water be 50°, the resultant heat at which the feed leaves the injector will approximate 149°. The injector has been doing excellent work wherever it has been fitted.



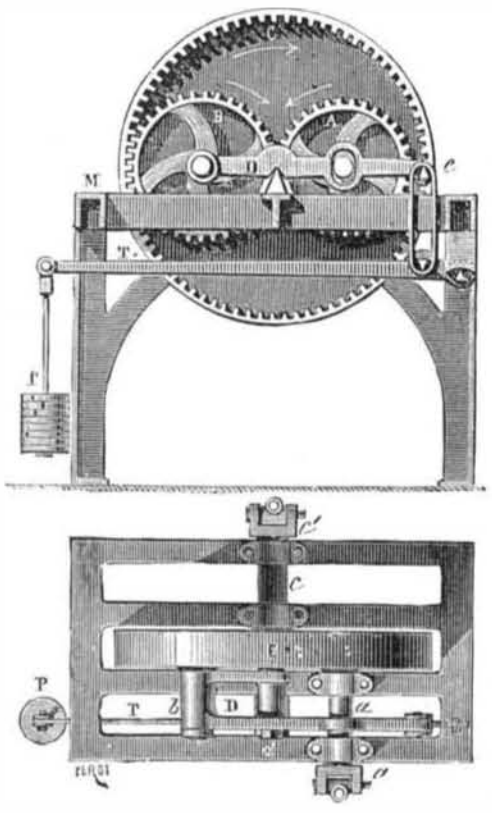
THE BINARY INJECTOR.

New Jersey Glass Blowers.

According to a table compiled from replies to a letter of inquiry sent by the New Jersey Labor Bureau to the glass blowers at home and abroad, the average yearly earnings of glassblowers in New Jersey is from $1,064 to $1,080 per annum according to the kind of work done. One glass-blower, who lost twenty days during the year, reports that he received $1,350 in wages. An English workman on the same kind of goods reports his income for the year at £120, or about $583. His hours of employment ranged from eight in the slack to ten during the busy season; that of the American workman from eight and a half to nine hours per day.

RAFFARD'S TRANSMISSION DYNAMOMETER.

The annexed cut represents a new transmission dynamometer, that is to say, an apparatus for measuring the power expended by machine tools. The motor acts directly upon the axle of the wheel, A, in the direction shown by the arrow, and this wheel carries along the intermediate one, B,



RAFFARD'S TRANSMISSION DYNAMOMETER.

which transmits motion to the inner-toothed wheel, C. The latter is connected with the tool to be experimented upon by the axle, c, and the Cardan joint, c'. The axles, a' and c', revolve in bearings fixed to the frame, M, but the axle of the wheel, B, revolves in a bush which is carried by a beam whose fixed axis passes exactly through the contact of the primitive circumferences of the wheels, A and B. The result of this is, that the momentum of the force exerted by the wheel, A, upon B, is null with respect to the edge of the knife-blade upon which the beam oscillates, and that, consequently, such force has no tendency to move the beam in one direction more than in another. The beam, then, is only influenced by the resistance that the wheel, C, offers to the motion of the wheel, B; and it is such resistance that, by a system of levers in a ratio of 1 to 10, is measured by means of the weight, P.

In order to simplify calculations the primitive circumference of the wheel, C, is made equal to 3 meters. The formula of the work then becomes very simple: $T=\frac{P\times10\times3\times n}{60}=\frac{P\,n}{2}$, in which T is the work per second, P the weight situated at the extremity of the lever system, and n the number of revolutions per minute.

It should be remarked that this dynamometer will permit of obtaining results that are not very far short of the truth; since, save the friction of the wheel, C, all the friction of the apparatus is external to the measurement. Now, the force which acts on the wheel, C, being transmitted in a direction opposite the gravity, the friction due to the weight of this wheel need not be taken into account. There only remains the friction of the teeth; but it is well known that wheels with inner teeth, especially when they are governed by a relatively large pinion, occasion very little friction.

If the causes of error of this new dynamometer be compared with those that exist in the White apparatus employed in the United States, it will be found that they are about four to five less.

By substituting a spring for the weight, P, any kind of a totalizer may be applied to the new apparatus.

The Return of the Rodgers Crew.

The Revenue steamer Corwin, which was sent to the relief of the officers and crew of the Rodgers (burned last winter in St. Lawrence Bay, Siberia), found on her arrival at the bay that the party had already been picked up by the steam whaler North Star. There were five officers and twenty-six men, all in fairly good health. They were transferred to the Corwin, which returned to San Francisco, arriving June 23. The commander of the Rodgers, Lieutenant R. M. Berry, with Ensign Hunt, were not with the party, having left St. Lawrence Bay, December 23, on a sledging search along the Siberian coast for the survivors of the Jeannette. At last report, April 4, Lieutenant Berry had arrived at Kolyma River, about half way between St. Lawrence and the Lena River.

On the 4th of February Master C. F. Putnam, commanding the supply depot at Cape Serdze Kamen, arrived at the native village where the Rodgers people had found refuge, with four sledges loaded with pemmican and other provisions for the party, he having heard of the loss of the ship through natives. He started on his return trip to the depot in bad weather, and was overtaken by a terrible gale of wind, with drifting snow, when two days out, and was obliged to turn back, and in his endeavor to reach the village on the southern side of St. Lawrence Bay, about twelve miles from North Head, he became separated from his native escort, and, not being able to see ten feet ahead of him, was carried out to sea on an ice floe. Later in the day he was seen about seven miles off shore, abreast of the village. A vigorous attempt was made to rescue him by four of the Rodgers crew and two natives in a canoe, but owing to the intervening ice they were unable to reach him. He was not seen afterwards. Search was made along the coast; four of his dogs were found, but no vestige of the unfortunate officer.

In a report to the Secretary of the Navy, sent forward by W. H. Gilder, Lieutenant Berry describes the burning of the ship, November 30. He was unable to determine the origin of the fire, but thought it most probable that it was caused by the heat from the donkey boiler, charring and firing the deck underneath. The records of the expedition were saved.

THE coast of Louisiana abounds in oyster banks, and a considerable oyster trade has been developed at New Orleans, giving employment to about 200 luggers, each manned by from three to six men.

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