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POPULAR MECHANICS

H. H. WINDSOR, EDITOR, 225 Washington St., CHICAGO, U. S. A.

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Contents for July, 1909

Motorcycle Fire Brigades 1
Wicker Auto-Observation Car 2
A Mechanical Skipping Rope 2
Scheme to Jail Fast Autos 2
Electric Death Chamber of a Prison 3
Broomcorn Has Substitute in Hay 3
Purse in the Palm of a Glove 3
Marvelous Electric Clock 4
Light Coal Consumption on Fleet Voyage 4
Largest and Most Powerful Locomotive in the World 5
Cost of Carelessness in Elevator Operation 6
Soldiers Mounted on Oxen 7
Exhausted Diver Floating to Surface 7
A Locomotive on Runners 8
New Curtain-Holder Arrangement 8
Sale of Old Army Rifles Stopped 9
The Emergency Signal of a Submarine 9
The Scheme to Signal Mars 10
Automobile Mail Service in Texas 11
Hand Magnet for Many Uses 11
Taking the Doctor on Board 12
Furniture of Palmetto Wood 12
Wrecked Quebec Bridge to be Recommenced 12
A Mountain Toll-Gate 13
Titanium Alloy for Rails and Car Wheels 13
The "Fulton" Built in Record Time 15
Aeroplanes as Scouts; Not Fighters 15
Nitro-Glycerine Lets Go in Illinois 15
Stack Ends Builder's Life 16
To Control War Fleets from Washington by Wireless 16
U. S. Scout Cruisers' Speed and Fuel Tests 16
French Device Diminishes Tire Punctures 17
The Great Metropolitan Tower 17
Work of Pilots on Suez Canal 17
Rules of the Road for Auto Drivers 18
Irregular Growth Makes Beautiful Woods 20
A Claimed Cure for Consumption 20
Interior View of a Submarine 21
Mechanical Window Attractions 23
Novel Storehouse of Yosemite Indians 23
Double Electric Cars of Self-Contained Type 24
World Commerce Breaks Record 24
Concrete Garbage Cans Resemble Tree Stumps 24
Machine Bores Post Holes 25
Mortorboat Averages 27.3 Miles Per Hour for 1,554 Miles 27
The Human Boneyard of Havana 27
The Great Exposition of the Northwest 29
Pendulum Gyroscope for Aeroplanes 32
Sectional Automobile Tire 32
Paris Has an Annual Ham Fair 32
Attempt to Quench Famous Burning Mine 33
A Dragon-Fly Flying Machine 34
European Fire Insurance Laws Stringent 34
Natural Grown Images Finished by Man 34
A Successful Wireless-Directed Torpedo 35
Difficulties in Construction of Alaskan Railroad 36
Great Lakes Car Ferry Rammed 37
Fulton Aerial Flight for $10,000 Prize 37
The Panama Canal 38
Kansas Cabbages 38
To Be the Only Figurehead in the U. S. Navy 39
Russia's War Automobiles 40
Government Position for a Thin Man 40
Engine Flays Itself with Steel Arms 41
Where Nature Cooks the Food 41
"Shadow" Clock for Theodore Roosevelt 41
Stack Resists Demolition 42
Primitive Siberian Calendars 42
Extinguishing Oil Flames with Foam 43
Another Design of Dressing Table 44
Railroad Tickets Printed as Demanded 44
Bridge Building with Aid of Cables 45
Greatest Industry to Abolish Sunday Work 45
Huge Centipede Kite 46
Texas Collects Big Fine 47
Powerful Explosive Invented by School Boy 47
Japan Grants Motor Fishing Boats Subsidies 47
Mammoth Boring and Turning Mill 48
Anglo-Saxon Blacksmithing 48
Smallest Woven Basket in the World 49
Driving an Ore Train 49
Fighting the Snow in Berlin 49
A New Steel Coke Car 50
Anti-Collision Device for Fire Houses 50
House Constructed of Beer Bottles 51
Novel Piano-Violin 51
Fox Hunting in England 52
Portable Self-Propelled Canal Lock 52
Barnum's Monument Robbed 53
How to Make a Settee 54
Ingenious Device to Reach Sunken Treasure-Ship 55
Electrically Driven Brass Polisher 56
A Human Alarm Clock 56
Suspending Telephone Wires without Poles 57
Small Ozone Water-Purifying Plant 57
Car for Poultry Transportation 58
Bengal Railway Has Home for Apprentices 58
Bottling Milk by Machinery 59
Ingenious Cell for Huge Reflector 60
Old Pocket Clock and Snuff Box 60
Tents on Wheels 61
Rabbits as Food as Well as Pests 61
Aeroplane Device for Bicycles 62
Adjustable Wind Shield 62
Larger Railway Ties are Necessary 62
The Wrights in England 62
The New British Army Targets 63
Machinery of Pioneer Steamer a Relic 63
Motorboat Legislation 63
Proper Air Pressure for Auto Tires 63
Huge Wooden Sailing Ship 64
Stretcher Fitted with Runners 64
Peculiarity in Construction 64
Gun Works at Sheffield, England 65
Battle Fleet in Prime Condition 66
Electrical Power from Wind Power 68
Railway Tracks Suspended from Cables 70
Another Addition to England's Great Fleet 70
Continuous Process of Drawing Wire 71
A Primitive Bit of Mechanism 71
Balloon Car a Lifeboat 72
Advantages of the Automobile Buggy 72
Portable Water Pipe 72
Box that Protects Flowers from Neglect 73
Adjustable Electric Lamp Bracket 73

(CONTINUED ON PAGE 6.)

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which could have been kept running with tolerable accuracy by setting it daily to the dials on the outside. Probably during a few days of cloudy weather the clock would "get off quite a little," but business was not pressing in those days. Besides, the timekeeper would swear by his little water wheel, anyway, and feel safe, as there was no higher authority wearing an American watch.

Some very interesting engravings of Japanese clocks and a general explanation of them, as well as a presentation of the Japanese mental attitude towards "hours" and their strange method of numbering them may be expected in the next chapter.

(To be continued)

THE FIRST PIPE LINES

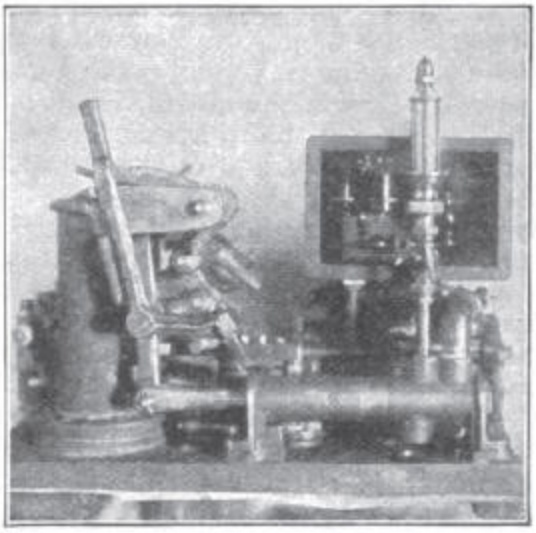
The first pipe line was built in 1815 when William Murdock, the discoverer of lighting with illuminating gas, installed a piping works to convey gas through shops near Birmingham, Eng. The line consisted of old musket barrels, bought at the close of the long European wars. The first pipe line in America was constructed at Fredonia, N. Y. in 1824 to illuminate the village inn in honor of the visit of General de Lafayette. The first natural gas plant was built in America in 1872, and consisted of 5½ miles of pipe line 2 in. in diameter, laid at Titusville, Pa.

Today pipe lines hundreds of miles long, carry gas, oil, water, and steam, some of the lines being six or more feet in diameter.

By law, an Englishman's property extends upward to the skies. What will this mean in aerial navigation?

A WIRELESS BLOCK SIGNAL SYSTEM

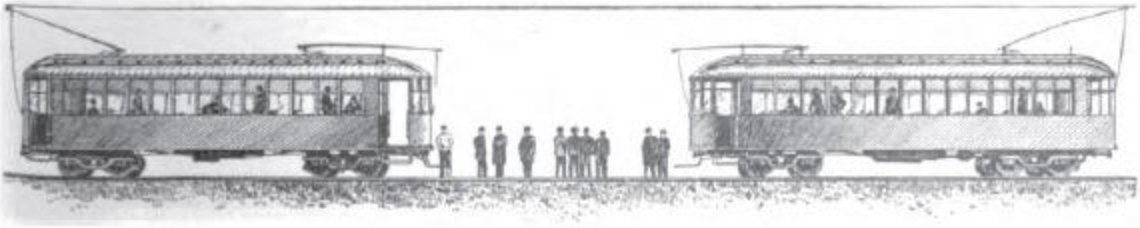
A new system of block signaling and train control has followed close upon the heels of wireless telegraphy and is founded on the same basic principle.



Wireless Block System Apparatus

This system has dispensed with signal posts, used by practically every other system. Hertz discovered that electric oscillations produced in a common circuit create a disturbance called an electric wave in the surrounding ether. This—the principle of wireless telegraphy—has furnished a medium to span the gap between the rails and a moving train and is something inventors have long sought. This new system is practicable for both steam and electric lines.

Naturally, to make this connection between the train and the track there must be two parts to the system, one on the track and another on the train. The connection is made thus: A generator at the end of each block generates an electric or wireless wave and



Cars Stopped by Wireless Block System

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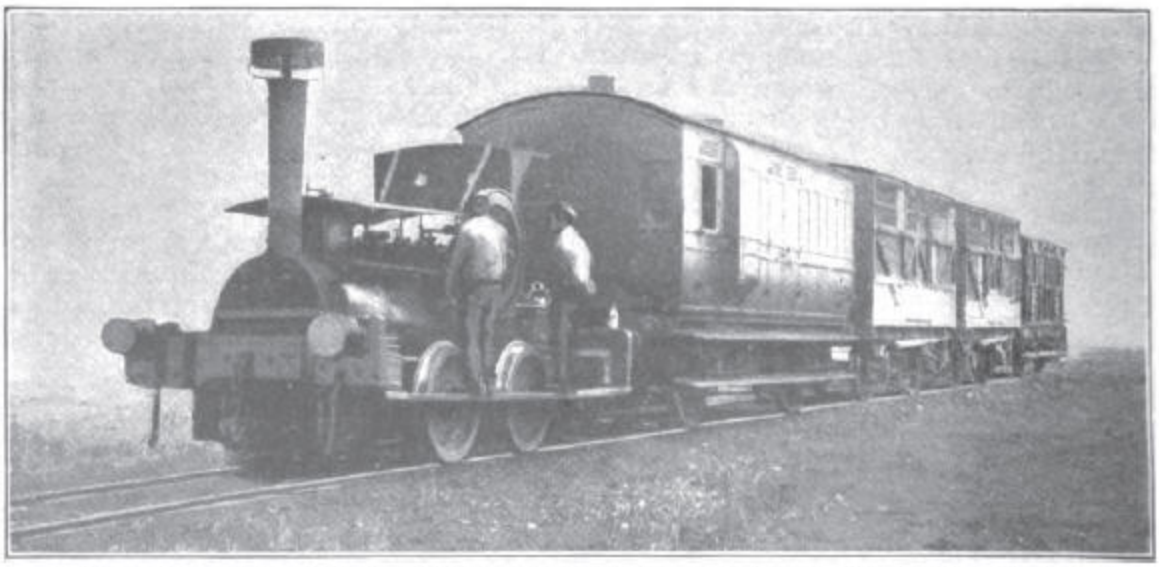
sends it continuously along a wire laid on the ties midway between the rails. These waves can be controlled and are confined to the area of the track. Hence the space above and between the rails is constantly filled with radiations of the electric wave and it may easily be seen that a train going over this block of track with an apparatus to catch the impulses of the wave will make a connection between the moving train and the track. For this purpose the train is provided with a pair of parallel rods, called antennae, about 8 in. above the rail, which receive the wave impulse and carry it to a device in the engineer's cab, which has automatic control over the train. This connection is made and broken twice each second by two revolving coherers and sends an "all's well" click to the engineer each time. This condition continues so long as the block ahead contains no train. The moment one train, or car, approaches another on the same track, within a pre-arranged distance, the waves cease, the steam is shut off and the air brake is applied automatically; at the same instant a whistle in the cab sounds. The engineer may be helpless or dead, but the trains come to a standstill, regardless of his condition. Should the system get out of order, or be tampered with, the train stops and the danger whistle blows. The engineer may start the engine and run along under control after a complete stop has been made, but the whistle continues to blow until the trouble is remedied or the track ahead is cleared, as the case may be. The device which controls the engine automatically occupies a space of only 2 ft. square in the engine cab.

A hair-raising demonstration was recently made for the benefit of railroad experts, on an interurban electric line running out of Chicago. Two large electric cars were headed toward each other on a single track, and brought up to a speed of 30 miles an hour each. The front platforms were unoccupied, the motormen being seated inside the car with the demonstrators. In this case the blocks had been arranged so as to allow them to approach within a few feet, at a point immediately in front of the spectators. At a speed of 60 miles an hour the cars drew together, and a tremendous smash seemed inevitable, but at the critical moment the power was cut off, the air brakes did their work, and the cars stopped only a few feet apart.

Major Baden Powell insists that the problem of aerial rules and regulations in and between countries must be solved within the next four years.



Old Locomotive or Tram, Oxford and Allegheny Railway—Locomotive Has Single Cylinder and Fly Wheel

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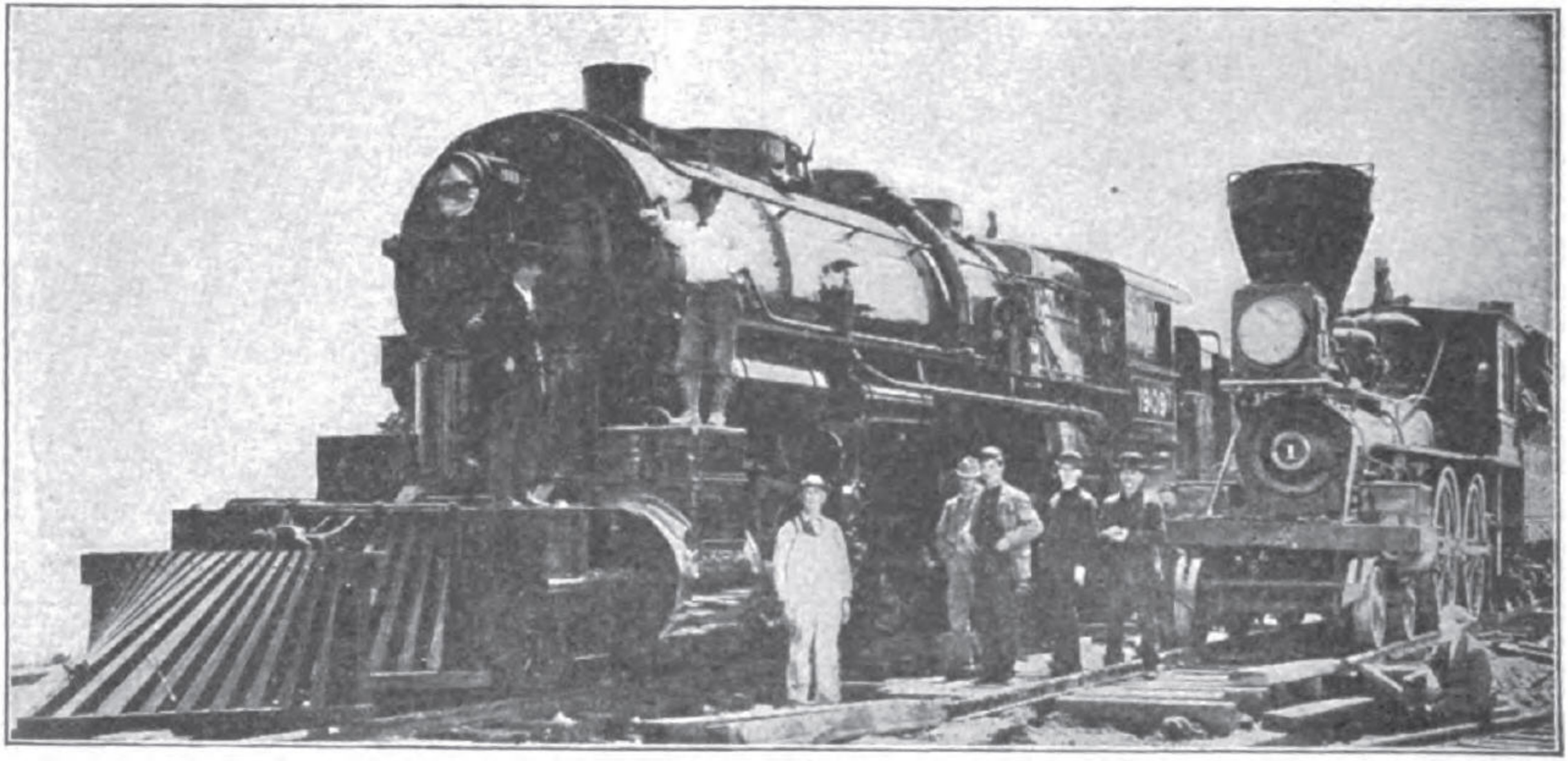
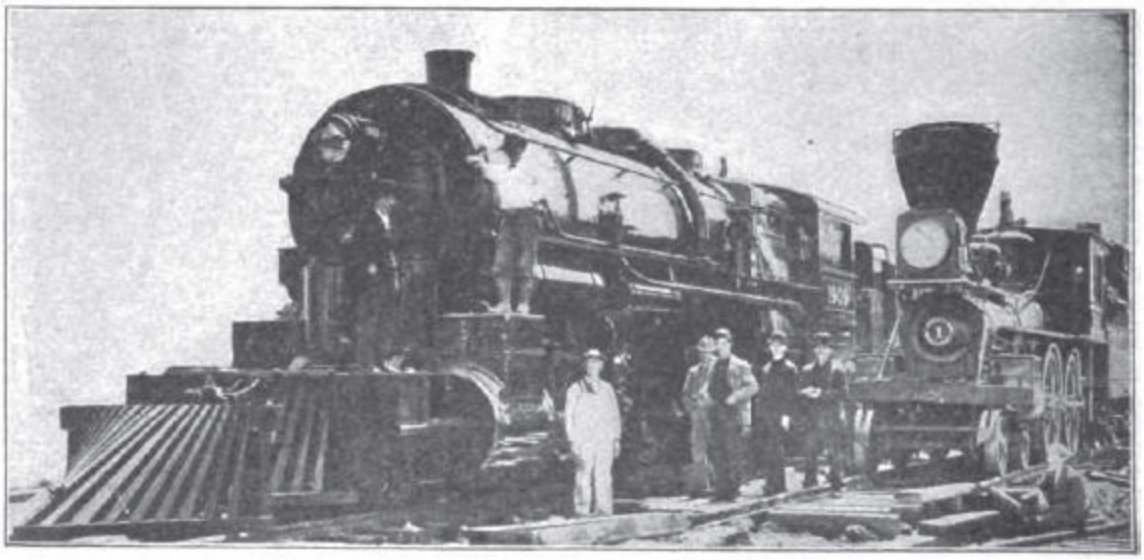


The "1909" Weighs Ten Times as Much as the "Crooks"

JAMES J. HILL CONTRASTS HIS OLDEST AND HIS NEWEST LOCOMOTIVE

By William Thornton Prosser

As showing the marvelous improvement in railway motive power in the last generation, and typifying in a way, the transformation of the Northwest of the late '60's into the Northwest of today, James J. Hill has placed on exhibition at the Alaska-Yukon-Pacific Exposition, in Seattle, the first locomotive to be operated on the progenitor of the present Great Northern Railway system, and alongside this out-of-date engine he has put the latest type of powerful locomotive, known as the Mallet, weighing almost ten times as much and having an efficiency even greater in proportion. Not less interesting than the contrast between these engines is the man in charge of the exhibit as the personal representative of Mr. Hill—Albion B. Smith, who at the termination of the Exposition will return to his cab as the oldest locomotive engineer in active service in the United States. "Number 1," as the small engine is known, seems almost the personal property of Engineer Smith, for he has ridden in its cab the greater part of the time since its arrival in St. Paul more than 40 years ago.



The "1909" Weighs Ten Times as Much as the "Crooks"

But the saucy-looking coffee pot locomotive has a more affectionate and endearing name than "Number 1." Its old friends of the early days know it entirely as the "William Crooks," the name given in honor of a civil engineer in the service of the St. Paul & Pacific, which was later extended to the Pacific Coast by Mr. Hill. Mr. Crooks, following his association with Mr. Hill, was chief engineer of the Oregon Railway & Navigation Company. For the last few years Engineer Smith has been operating on the Breckenridge division of the Great Northern, and today is so hearty and hale that he looks good for many more years of service, in spite of the seventy-one winters that have passed over his head.

The "Crooks" was built by Smith & Jackson, of Boston, Mass., in 1861. It weighs 55,400 lb. on its drivers. The diameter of its driving wheels is 63 in. Until 1868, it was operated without serious mishap on the St. Paul & Pacific, but in that year it suffered severely in a roundhouse fire, in St. Paul. Though in the early days it consumed wood, later it was converted into a coal burner, and today is in almost as good condition as in the beginning. It has made as high a speed

as 15 miles in 16 minutes, a record of which its captain is proud. Its hauling capacity has been tested up to 120,000 lb. on a level stretch.

It was following the roundhouse fire that Smith was employed to assist in the process of overhauling the "Crooks." From that time on he was the constant companion of the faithful engine for many years.

Many of the big Mallet type of engines are in use on the mountain divisions of the Great Northern, through Montana, Idaho and Washington. The engine of the "1909," as the A.-Y.-P. locomotive is known, weighs slightly more than half a million pounds, with its tender. Its design includes two high and two low-pressure cylinders. The diameter of the drive wheels is 55 in., while the tender will carry 13 tons of coal at one loading. The Mallet will haul 1,600 tons of freight on a 1 per cent grade. In the Cascade mountains two engines of a somewhat older pattern were required to move 1,050 tons of freight; now two Mallets negotiate the heavy grades with 1,600 tons, and consume no more fuel.

When Mr. Hill gave his famous birthday dinner, at his three-score-and-tenth milepost, he made up a train that was hauled from St. Paul to Lake Minnetonka by the "William Crooks," all resplendent in new paint and freshly polished brass trimmings. The guests at the dinner party were employes of the Great Northern who had been in the service of the company for 20 years or more. Engineer Smith, who had spent the greater part of his life with Mr. Hill, operated the "Crooks" on that memorable trip, and his fireman was another veteran of the rail.

"I understand you're going to dump 'Number 1' in the scrap heap pretty soon," said Engineer Smith to his grizzled chief at that dinner.

"Not while I'm around; the 'William Crooks' will last as long as I do," was the response.

The University of Paris has received endowments of $240,000 with which to promote aviation.

SAN FRANCISCO GETS THE "GJOA"

The photograph shows the famous sloop "Gjoa" lying along the Independence dock at Mare Island, Cal. In it,

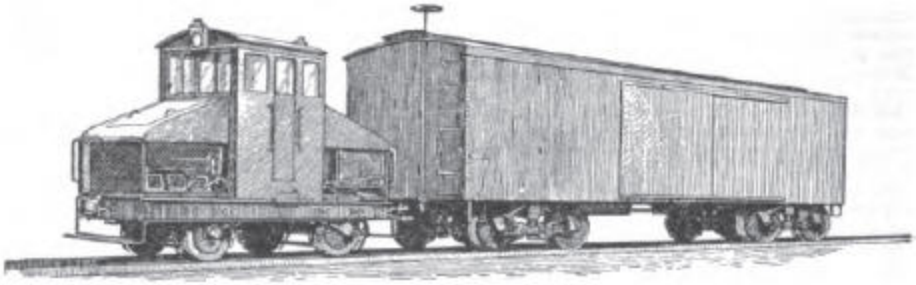
Now One of San Francisco's Sights

Capt. Roald Amundsen made the first and only trip that has ever been made through the Northwest Passage. This passage had been unsuccessfully sought for since 1497.

Capt. Amundsen set out from Christiania, Norway, on June 16, 1903, and arrived at San Francisco on Oct. 19, 1906, having passed through perils of fire, reefs and fierce Arctic storms. The vessel was built in 1872, is 70 ft. long with a 20-ft. beam, and has a dead weight of 134 tons. She is equipped with a 2-cylinder oil engine of about 30 hp. She has recently been presented to the Golden Gate Park of San Francisco and will be placed in it.

GASOLINE-DRIVEN SWITCHING LOCOMOTIVE

The gasoline-driven locomotive as shown in this illustration develops 75 hp. at 400 revolutions of the engine per minute, and is of the type now rapidly coming into use for switching cars in the yards of large manufacturing plants. Often switching is required only four or five hours daily, and when steam engines are used it is necessary to keep up fires for about 11 hours to perform this work. With the gasoline locomotive there is, of course, only fuel consumption during actual running.



Courtesy Anderson Engine Co.

Powerful Gasoline Locomotive

This locomotive uses from 60 to 65 gal. of gasoline in 10 hr. steady running at full capacity, but usually no more than 30 gal. is required for such steady service, as at times when the locomotive is running light the throttle is retarded and very little gasoline is used. The transmission is made for three speeds of from 3 to 40 miles an hour, either forward or reverse.

REVOLVING DOORS SWUNG BY ELECTRICITY

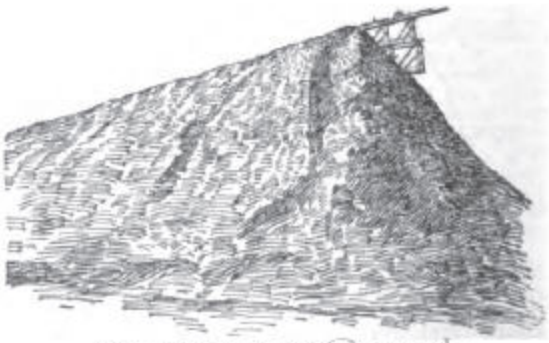
The revolving doors leading into the Hotel Astor in New York, which used to require the entire strength of a doorman to swing, are now swung by simply pressing a button. The doorman stands in the lobby some distance from the doors, and in his hand he holds an electric button attached to a wire. When a person approaches from either the street or the lobby the button is pressed and the door-swinging apparatus brought into play.

SIXTEEN-INCH GUN BUILT BY UNITED STATES

A 16-in. gun, the largest in existence today in the whole world, has been built for the United States army and temporarily mounted at Sandy Hook. It is proposed to ship the gun to the Philippines and mount it on Corregidor island for the defense of Manila. The 12-in. guns are not powerful enough to completely command the channel, but this new gun would deliver a blow 11,000 ft., which, if it got fairly home, would probably disable any modern battleship.

HUGE PILE OF SLACK BURNING INTERNALLY

Although external evidence does not carry out the assertion, this huge pile of slack, more than 100 ft. high, has been burning internally almost since the time the pile was started. It is the deposit of one of the coal washers at Pana, Ill., and it has been named Mt. Schuyler, after the mayor of Pana, who refused to have the slack removed.



Fire Smolders in This Slack Pile

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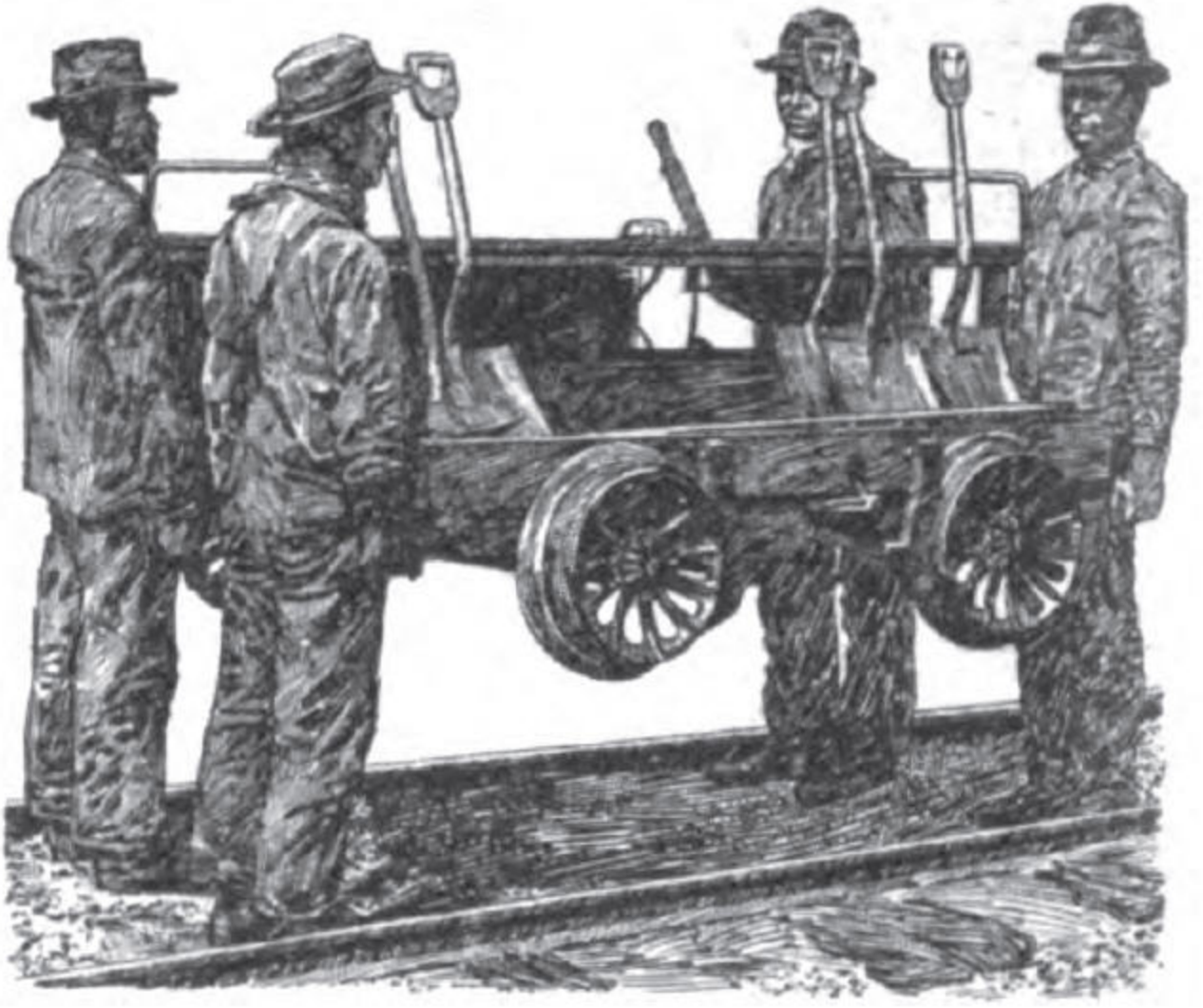
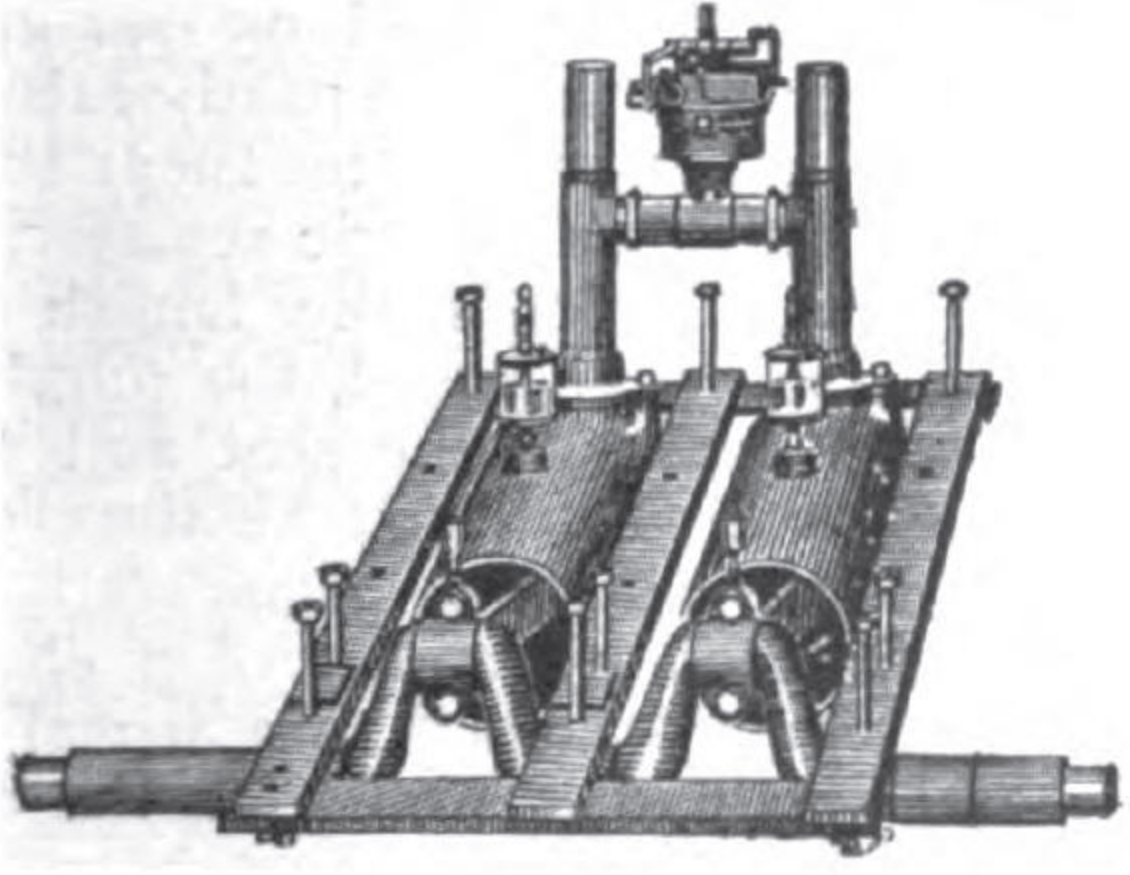


Car and Tools Lifted Bodily by Four Men



Direct-Connected Engine

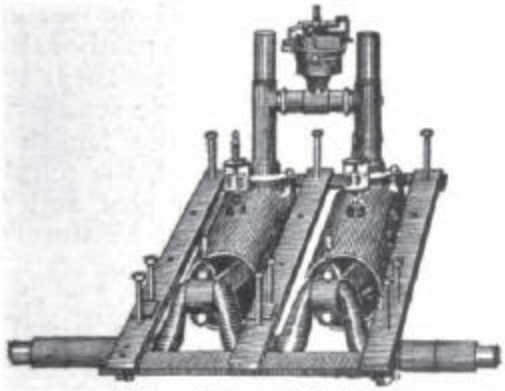
Motor Section Car Carrying Nine Men and Tools

NEW BRAZILIAN TORPEDO BOAT DESTROYER

The accompanying set of illustrations are interesting views of the interior of the new Brazilian torpedo boat destroyer "Matto Grosso." The accommodations for both officers and crew seem exceptionally good for a vessel of its class. The captain's cabin, the ward room, and one of the crew's spaces are shown, as well as the engine room.

MOTOR SECTION CARS

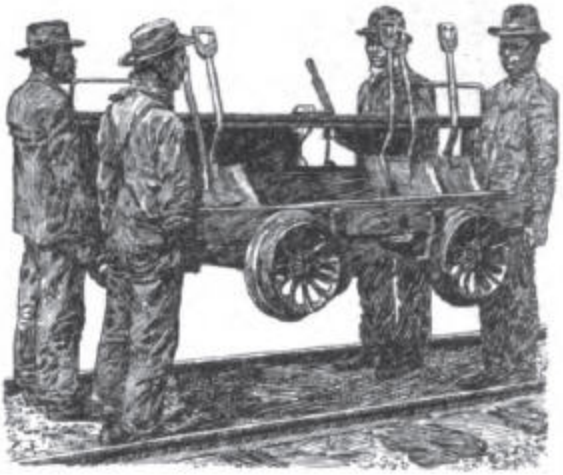
While motor inspection cars have been used here and there on various



Direct-Connected Engine

railroads for the past few years, the Chicago, Milwaukee & St. Paul railroad is the first adopting such cars for its section crews covering an entire division. The first division thus equipped is that beginning with the Chicago terminal and extending to Galewood, Ill., a distance of 129 miles. From the standpoint of traffic handled, this division is the busiest on the entire system, and the fact that all of the hand pump cars of the division have been dispensed with and turned in shows the confidence of the officials in the motor-driven cars.

The use of motor section cars was decided upon mainly for reasons of economy in operating expense, but the increased facility of transportation and track inspection is also greatly appreciated. The cars used embody two items without which such operation could not be successful, the first being reduction of weight to such a point that two men can quickly remove a car from the track, and the



Car and Tools Lifted Bodily by Four Men

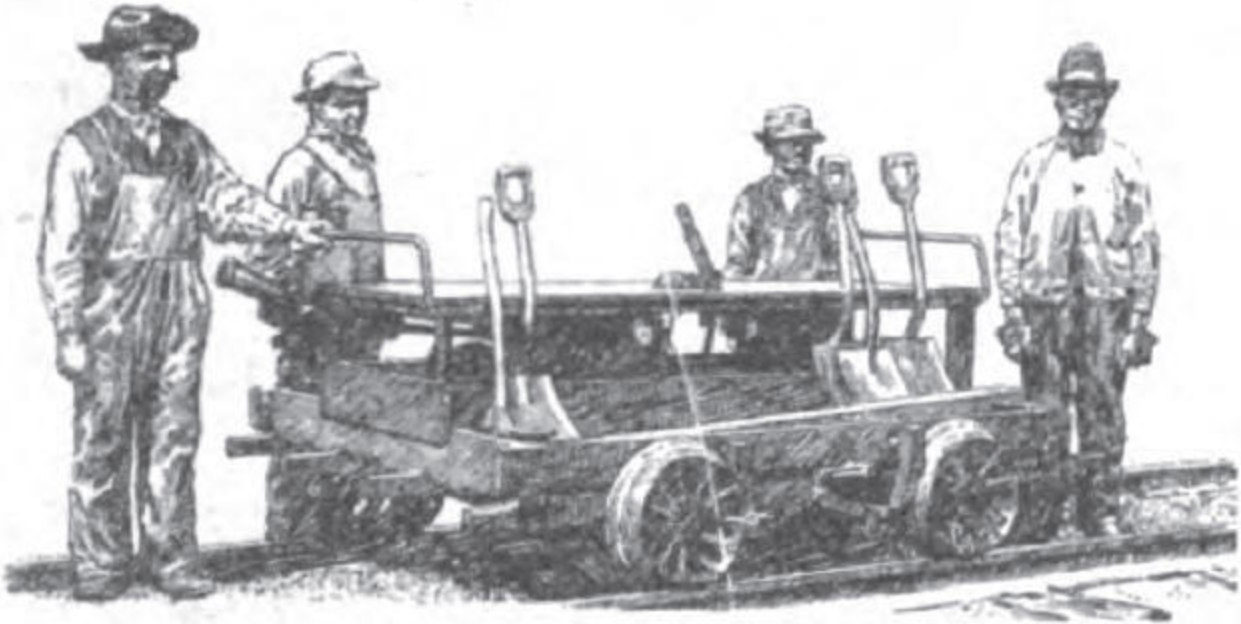
second being an engine of such simple design that men of ordinary intelligence and skill can operate them without too much tinkering to keep them in working order, and without frequent annoyance and delays from breakdowns.

The type of car used weighs 750 lb., and to simplify matters gears and chains have been eliminated and the cylinders of the engine are direct-connected with the axle. One car will comfortably carry 10 men, and, should requirements demand it, has sufficient

Motor Section Car Carrying Nine Men and Tools

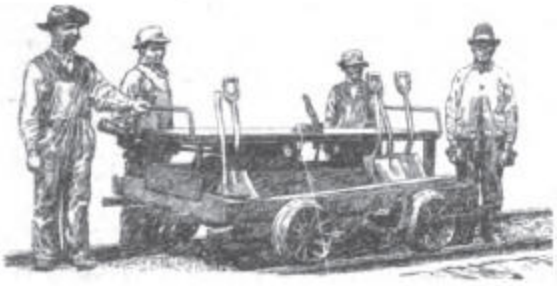
power to carry as many men and tools as can be crowded upon the platform

engines develop 7½ hp, and drive the



Ready to Start

which is 6 ft. long by 52 in. wide. The engines develop 7½ hp., and drive the



Ready to Start

cars at a speed ranging from 3 to 30 miles per hour.

RHODE ISLAND TURKEYS DOOMED

Rhode Island, which is famous for its turkeys and for many years has supplied the Presidential Thanksgiving table, is confronted with the prospect of their extermination. Some 16 years ago the United States experiment station at Kingston began an investigation of the so-called "turkey ail," later denominated the blackhead disease, which has and still is killing turkey flocks. The net results of the study, continued ever since, has been the identification of an organism which causes "blackhead" by attacking the caeca or blind canals of the intestine, but no method of fighting it successfully has been discovered.

The disease is easily transmissible, and is contracted by birds of the air without fatal results, while in the case of the turkey few attacked survive. Land which has been used by an infected flock retains the infection and passes the disease on to younger generations of turkeys.

SELF-REGISTERING SEATS FOR PUBLIC CONVEYANCES

A Nebraskan has invented a self-registering seat for public carriages and other conveyances. The seats are in sockets and mounted on springs. When not in use they are partly raised, and when a person sits on them they set in operation an electric registering device which records the length of time the person is seated, the number of persons who use the seat and the distance covered during the time the said seats are occupied. This last record is obtained by means of a chain gear which is attached to a wheel of the carriage, and is similar to the device used on taxicabs. Just how the device is to be used to profit seems to be a question.

A Flock of Young Rhode Island Turkeys

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Snow Scene in North Dakota, Railroad Drifted Over Shortly After the Snow Plow Had Passed

MACHINE RENEWS RAILS WHILE IN USE

According to the U. S. consul at Sydney, an Australian inventor has designed a machine that is being successfully used for prolonging the life of street car tracks. It is known as a rail-planer, and its work is to restore a rail to its original level and evenness of surface. One of the contracts of the concern manufacturing the machine calls for the deepening of the groove in the flat rails in which the flange runs, and the reduction of the narrow outside lip to the level of the rest of the rail. All this will be done in one operation as the machine moves forward on the track. Accuracy of cut with the moving machine on an uneven track is secured by the adoption of self-adjusting machinery.

The claim of the inventors of the machine is that by restoring a rail in this manner the cost of putting down a new rail is postponed for many years, and the inconvenience that follows the tearing up of the track is obviated.

TO ENCOURAGE IRON INDUSTRY IN BRAZIL

Immense deposits of iron ore exist in Brazil, and to stimulate the industrial development of this valuable national resource President Pecanha has asked from his congress the authority to give a company or companies formed for the purpose such government aid as might be necessary. General F. de Sousa Aguiar, just retiring from the office of prefect of the federal district, has been appointed as a commissioner to go abroad for the purpose of securing the capital desired.

Six hundred Chicago industrial workers met violent death while at their tasks during the past year.

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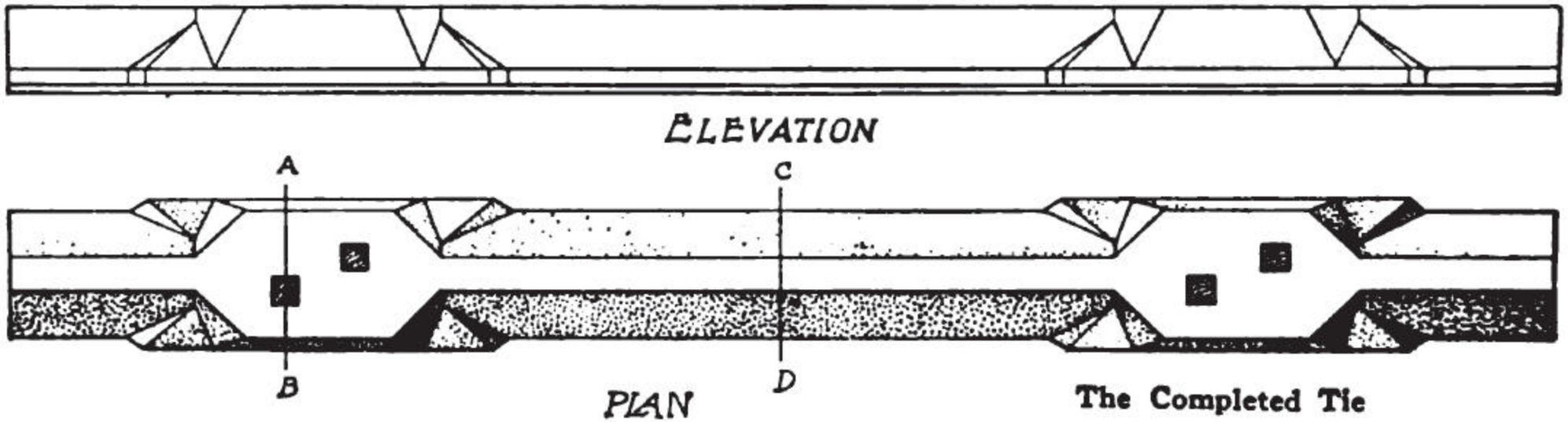
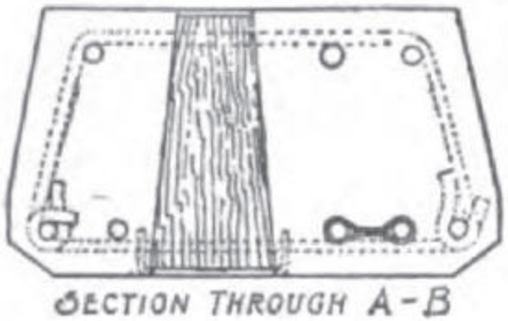
several years of successful experiments.



The Completed Tie



Reinforcement Where Rails Rest

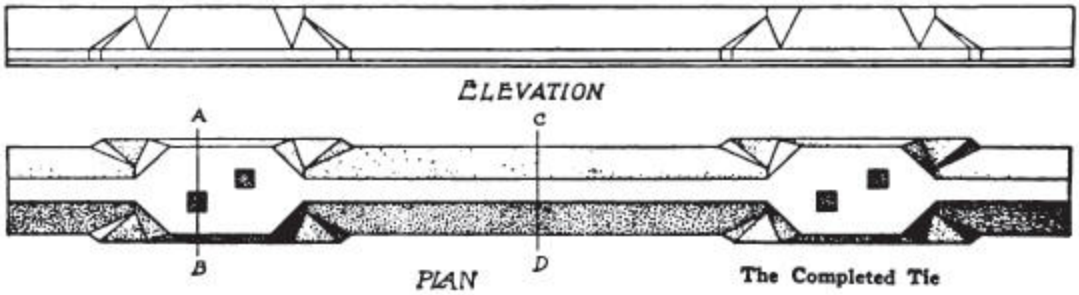
Reinforcement in Center of Tie

the machines, which will also be useful to large conventions, railroads, ball parks, theaters, etc.

The cut here shown was made from

ITALIAN CONCRETE RAILROAD TIES

The Italian state railways commission has recently placed a contract for 300,000 reinforced concrete ties, after several years of successful experiments.



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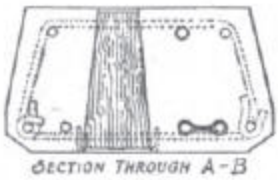
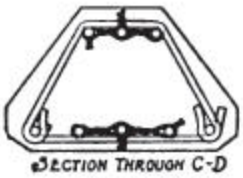


Reinforcement Where Rails Rest



Reinforcement in Center of Tie

The cost of each tie is about $1.25, and their life is said to be at least four times that of wooden ties. One tie of every thousand will be tested to destruction and the character of the concrete and its bonding with the reinforcement examined.

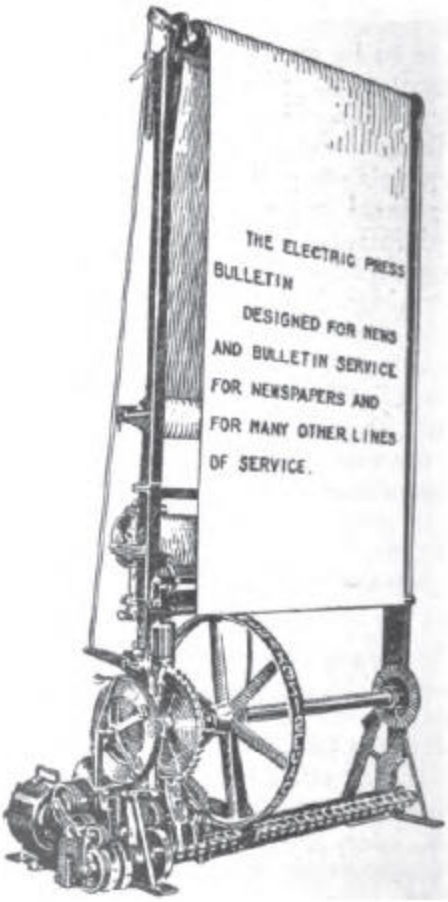
The ties are formed as shown by the drawings, weigh about 286 lb. each, of which 28 lb. is reinforcing metal, and are 6 ft. 3 in. long, 1 ft. in width, and 6 in. in height. The method of reinforcing with iron bars is clearly shown.

AN ELECTRIC PRESS BULLETIN

This new machine, the first of its kind, was designed and built principally for the bulletin service of a newspaper, yet it can be used for many other purposes of a similar nature.

The machine is electrically controlled so that any number of them can be set up miles apart and all connected by wire to a common typewriter keyboard which will cause all of the machines to print the same matter simultaneously. A record of the working of each machine, no matter how distant, is always before the operator. Two wires run to each machine from the keyboard and anyone who can push a key on a typewriter can operate the machines, which will also be useful to large conventions, railroads, ball parks, theaters, etc.

The cut here shown was made from



a photograph of the standard size machine for newspaper service. It is 8 ft.