CHICAGO & WESTERN INDIANA'S NEW PASSENGER CAR YARD, CHICAGO.

The passenger equipment of the tenant lines of the Chicago & Western Indiana Railroad, which include the Grand Trunk, the Monon, the Wabash and the Erie, having outgrown the facilities afforded at Taylor and Eighteenth streets for the cleaning and repairing of coaches, it was found necessary to consider the building of a new coach yard. Such an undertaking was out of the question where the old yards are now located. The nearest other available tract of ground owned by the company was found to be between Forty-ninth street and Fifty-fourth place, just west of the main passenger tracks, this tract being located about 4½ miles from Dearborn station.

In view of the fact that the city ordinance provided for the elevation of all tracks in this vicinity, it was found necessary for the new coach yard to be constructed on a surface, the grade of which should be level with the final grade of the main passenger tracks on the east, and the freight yards of the tenant companies, the Erie and the Monon, on the west. The construction of the yard, therefore, involved the placing of about 400,000 cubic yards of sand fill before the track layout could be started.

The whole work is under the general supervision of Mr. E. H. Lee, chief engineer, with Mr. M. K. Trumbull, chief assistant. The consulting engineers in charge of the plans of power house and its equipment are Messrs. Stephens & Tyler, Monadnock block, Chicago, and the architectural work on the building was done by Mr. John Witherspoon.

The first problem that presented itself was to settle upon a satisfactory track layout which would admit of economical handling of trains both to and from the city. It was necessary also to provide that the layout should be sufficiently comprehensive that the capacity of the yard can be increased when even greater facilities are required, as is probable for the near future.

After the yard scheme as to track layout had been decided upon, it was necessary to consider those features peculiar to the requirements of a coach yard, such as the spacing of tracks, character of platforms, piping, repair tracks, wheel pit, supply houses, turntable, power plant, etc. The yard commences at Forty-seventh street and extends without a break to Fifty-first street, where a subway is provided for in the city ordinance. This made it necessary, in order to save expense of bridging every track and also to locate the supply houses and repair tracks centrally, to handle the north and south yards separately. The south yard extends from Fifty-first to Fifty-third streets. The outside tracks, one on the east and two on the west, cross the street on bridges and are used as running tracks, also for making up trains. The further means of connection between the north and south yards is by a runway bridge crossing Fifty-first street, for the purposes of trucking, and also to carry steam, air, water and gas piping across the street.

In the center of the yard longitudinally the spacing of the two center tracks is made 22 feet wide in order to admit of trucking the full length of the yard. In this wide space a concrete conduit of oblong section has been constructed which is used for housing the mains of the steam, air and water distributing systems. In the floor of this conduit a gutter was constructed for draining the yard and for carrying off water from the power plant.

The power plant is located at the extreme north end of the yard, and is in some respects of somewhat unusual construction. The original elevation of the yard having been about elevation 14, and the final elevation of the yard 28.25 feet above city datum, it was decided to make the floor of the basement of the power plant at elevation 10, running the foundations down to elevation 6. This meant that when the sand fill would have been completed so as to surround the building on all sides, the foundations or walls below the top of the sand fill should be constructed as retaining walls to withstand pressure from without. These foundations were built of Portland cement concrete, with a batter on the outside at a rate such that the width of base was 40 per cent of the height.

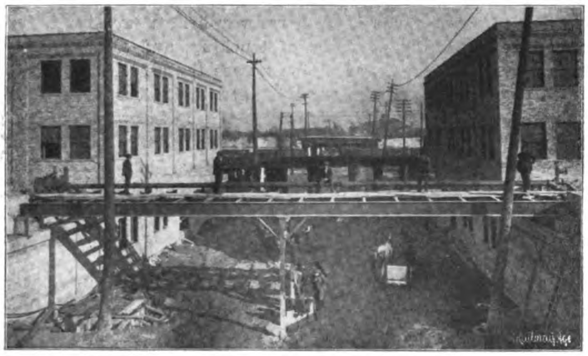
The brick stack was of so great weight that it was deemed necessary to drive piles upon which foundations should rest. These piles were 25 feet in length and spaced 2½ feet on centers near the rim and 3 feet on centers near the center.

Authority was secured to make this yard as nearly a unit as possible, so that everything could be done to the coaches that would be found necessary in preparing them for the road in the way of cleaning, testing of air brakes, filling the tanks with gas for lighting, replacing defective wheels, making all repairs excepting where rebuilding would be found necessary, keeping warm in the winter to prevent freezing of piping and installing a turntable for turning those

CHICAGO & WESTERN INDIANA COACH YARD—GENERAL VIEW LOOKING NORTH.

cars which it is desired to have always heading in one direction with relation to the engine.

The track layout admits of a capacity of 285 coaches of an average length of 72 feet, exclusive of the running tracks and repair tracks. The repair tracks have a capacity of 15 coaches. Provision has been made so that the capacity can be increased to 500 coaches by lengthening and widening the yard.



CHICAGO & WESTERN INDIANA COACH YARD—FIFTY-FIRST STREET.

The tracks in the coach yard are all ballasted with slag. There are 14 tracks in the north yard and 12 in the south yard, both including running tracks. The spacing of the tracks is alternately 16 and 17½ feet, exclusive of the wide space in which the conduit is located. Spacing was arrived at after a study of conditions, the determining factor being the economical distance between tracks, such that there would be room to get around easily for the workmen, also sufficiently wide that the spatter of water during the washing of cars on one track should not spoil the cleaning already completed on the next track.

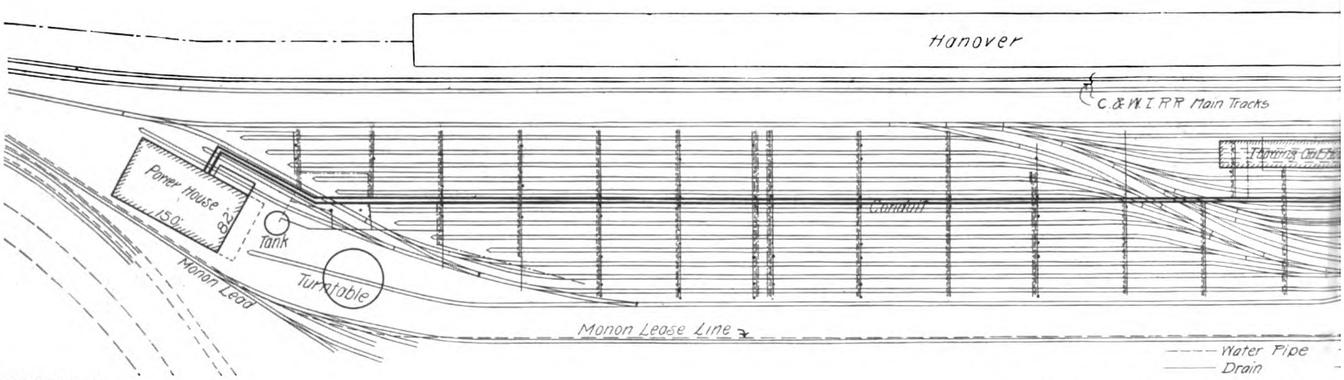
There is a cross run 12 feet in width in the center of each the north and south yards for trucking, and at the west end of each have been placed covered platforms for cleaning bedding, carpets, etc., in bad weather. The platforms are constructed of pine boards, 2 by 10 inches, with the exception of the planking in the vicinity of the repair tracks, where 3-inch material is used, with heavier foundations, so that jacking may be done in repairing cars. The platforms are .1 foot above top of rail, and in the yard proper the edge of the platform comes 5 feet from the center of the track. The surface of the platform is not broken by having piping or valves projecting.

There are five repair tracks, with a capacity of 15 coaches, three of which have access to the drop pit. This pit is constructed of concrete and has on its floor a track of 20-inch gauge, upon which is placed a telescoping air jack mounted on a truck to admit of moving to any point in the pit. The drop pit extends into the supply house, where there is a compressed air lift and trolley for handling wheels to and from the lathe. This lathe will be run by electrical power.

The wheel tracks will have as an auxiliary a movable crane for picking out any pair of wheels that may be wanted, and moved from any point to the drop pit, also for loading and unloading cars of wheels.

In the coach yard, which is calculated to furnish facilities for five different companies, necessarily there are standards which are peculiar to each company. Wheels are generally placed on the track in bunches, so that when one wheel is wanted it is necessary to go where it stands on the tracks and pick it out.

The supply houses situated at Fifty-first street are of brick; the one on the south side of the street, to be used by the Pullman Company, is two stories in height above tracks and one below, the latter being on a level with the street. The same is true of the front portion of the Chicago & Western Indiana supply house, on the north side of the street. Each building is to be equipped with a 10 by 12 foot electrical freight elevator, with a capacity of five tons. In addition to the above, the Chicago & Western Indiana supply house will have a machine, blacksmith, carpenter, upholsterers', car foreman's, tin, steam and air shops. A wing runs back from the front portion of the C. & W. I. house, which is two stories in height above the track level, the first story containing the shops mentioned above and the second story the office and light supplies.



THE RAILWAY AGE

CHICAGO & WESTERN INDIANA PASSENGER

Back of the C. & W. I. supply house is situated the thawing out house, which has two tracks, each with a capacity of two coaches of the greatest length now in use. This thawing out house is provided in order quickly to prepare a car for service after it has entered the city badly frozen up. When such a car enters Dearborn station the car foreman at Fifty-first street is notified by 'phone, so that by the time the car is switched to the coach yard the air in the thawing out house can be raised to a sufficient temperature to melt ice in the pipes in from 20 to 30 minutes. Below these tracks, pits similar to a roundhouse pit are constructed of concrete, in order that repairs may be made to the pipes while the car is standing in the house. Where it is necessary to jack a car up for any purpose to make repairs to its piping, this can be done before car is taken out. The floor is of concrete as well as the pits. The building is of brick and of sufficient inside height to admit any jacking up of cars that may be found necessary. The entrance to this thawing out house is fitted with large swinging doors, by means of which, in addition to the windows, the temperature can be reduced very quickly after a car has been thawed out.

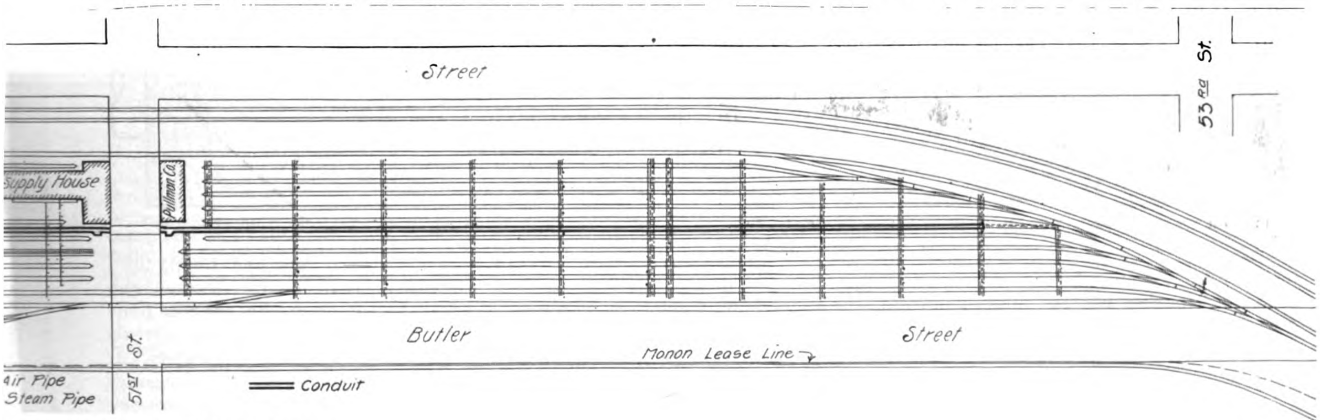
The conduit located in the wide space is so constructed for the greater part of its length that the top of the roof serves as a portion of the platform. The conduit is of concrete, with floor from 12 to 15 inches in depth, sufficient to accommodate the drainage gutter. The walls are 9 inches in thickness and roof 9 inches in thickness, except where crossed by tracks, where the sections are reinforced to carry the loads. The conduit where it passes below the tracks has from 12 to 24 inches of embankment as a cushion. At the point where the conduit crosses below the drop pit the lowest portion of the grade line is reached. Three inches of space are here provided from the roof of the conduit to the under side of the drop pit to provide for settlement.

The design of the conduit is on the basis of the minimum amount of material, and reinforcing rods are used to make the smallest sections possible. At Fifty-first street a runway bridge is used for trucking purposes between the north and south yards and also to carry piping, the piping being covered by a creosoted timber housing to protect it from the frost.

There is a manhole on each side of Fifty-first street, which connects the conduit with the city sewer main, the one to the north receiving the drainage of the north yard and the drip and blow-off from the steam main north of Fifty-first street. The manhole on the south side of Fifty-first street carries the drainage of the south yard to the sewer. A large drip basin has been provided at the south end of the conduit in the south yard to take up the drip and blow-off at that end. The concrete conduit, as will be seen from the cross section, is provided with a gutter in the bottom to take off the drainage of the yard. The side drains enter the conduit close to the water laterals, these latter drains being 9 inches in diameter, of vitrified tile pipe. Each has take care of all movement in the main due to changes of temperature. Between these expansion joints and wherever the lateral connections take off anchorage fittings are provided so as to properly confine all movement which would disturb the setting of valves. So far as possible, the main has been given a grade in the direction of the flow of steam. The only cases where this is not true are: First, where the conduit runs from the power plant up to its grade in the

CHICAGO & WESTERN INDIANA COACH YARD—THAWING-OUT HOUSE.

coach yard; also, at Fifty-first street, where the conduit has to rise to the grades of the runway bridge. The steam main is supported by concrete piers placed 6 feet apart, which have roller bearings. At each point where the diameter of the main changes, a large gate valve is placed, so that in case of a breakdown at any point in the yard beyond such



H YARD AT FIFTY-FIRST STREET, CHICAGO.

communication with the surface of the yard by catch basins, with a drain to catch the drip from the water service tap.

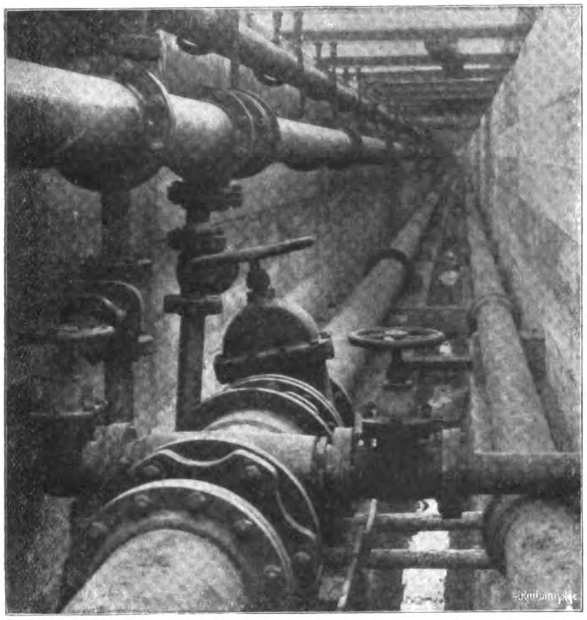
Steam laterals take off from the main in the conduit at intervals of from 360 feet to 550 feet. These laterals are 3 inches in diameter and are encased in sectional wood covering, which covering is lined with tin with 1½-inch dead air space provided between the tin and the steam pipe, which is covered with asbestos, firmly wired. The outside of this sectional covering is protected by a 3-ply layer of felt, which in turn is covered by asphalt mastic composed of asphalt and sawdust. The risers for steam service take off from the laterals at every track space and are insulated in the same manner as the laterals. These risers have a foundation of concrete and the clear space between 1½-inch steam pipe composing risers and sectional covering is sufficient to provide for the expansion of the laterals.

The steam main in the conduit is covered with 85 per cent magnesia sectional covering for insulation, and it is proposed in addition to surround this with a box containing sawdust for further protection to the sectional covering. At points where valves, expansion joints, etc., occur, the main is insulated with a magnesia composition put on in the plastic state. The steam main is provided with double slip expansion joints at intervals not to exceed 250 feet, which amply change the remainder of the system will remain intact for service. In almost every case laterals are taken off from the main by crosses, with the grade of outlet at the top of the main. The value of this detail is obvious. Valves are placed in the laterals where they take off from the main, so that in case of a breakdown in one of the laterals it can be repaired without shutting down the plant.

The water and air service laterals are practically the same, with the exception that they are supported by hangers from rails in the roof of the conduit, placed every 6 feet, the difference in the manner in which these laterals are taken off from the mains being that the laterals on each side of the conduit come together before entering the main and have but one valve, so that in case of a breakdown in any of the laterals the corresponding one of the pair would be out of service during the time to repair.

Water and air mains, both of which receive a certain amount of heat from the conduit from the steam main, are equipped with expansion joints, so that no breakage may result from change of temperature. In each case the water and air have expansion joints on each side of the Fifty-first street bridge, and also in the vicinity of the cross runs in both the north and south yards. The air main is provided with a drip in each yard. The water and air laterals take off from the main every 98 feet. The water and air risers are provided with boxes 2 feet in diameter, constructed of creosoted timber or brick. Access is thus had to the check and waste valves or fittings at the bottom for cleaning and repairs. At the top of all steam, air and water risers are provided boxes with false bottoms, so as to keep the valves as clean and free from freezing as possible. Access is had to all tap boxes by hand covers situated in the platforms. The hose connections are located just at the edge of the platforms.

The idea of running the lateral drains in close proximity to the water and air was to utilize the warm air passing through the drain from the conduit as an additional protection to water and air pipes in winter.



CHICAGO & WESTERN INDIANA COACH YARD—CONDUIT WITH PIPE LINES.

The following list gives the number of feet of steam, water and air pipes used in the complete system:

Steam System.—One hundred and three taps—99 steam taps in yard, 4 in thawing out house:
- 747 lineal feet 10 -inch pipe.
- 1,008 lineal feet 8 -inch pipe.
- 568 lineal feet 6 -inch pipe.
- 476 lineal feet 5 -inch pipe.
- 1,828 lineal feet 3 -inch pipe.
- 400 lineal feet 1½-inch pipe.
- 5,200 lineal feet 1 -inch pipe.

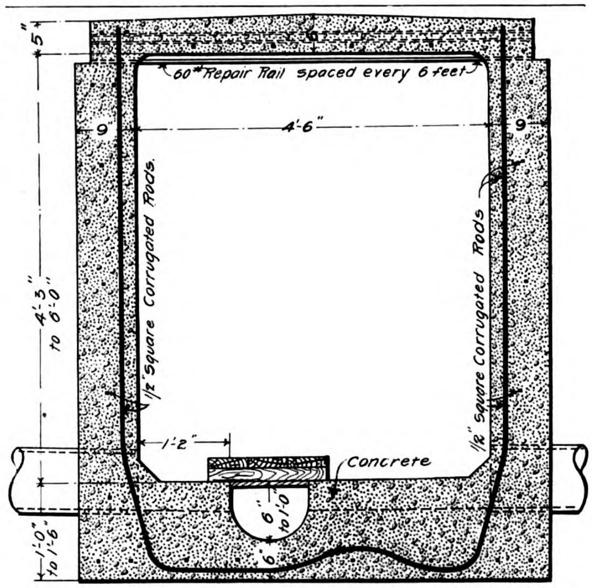
Water System.—One hundred and twenty-three double water taps, 14 hydrants, 1 locomotive crane:
- 69 lineal feet 12 -inch pipe.
- 73 lineal feet 8 -inch pipe.
- 1,584 lineal feet 6 -inch hub pipe.
- 2,793 lineal feet 6 -inch fl. pipe.
- 1,158 lineal feet 3 -inch pipe.
- 3,774 lineal feet 1½-inch pipe.

Air System.—One hundred and eighteen taps:
- 1,484 lineal feet 5 -inch pipe.
- 828 lineal feet 4 -inch pipe.
- 486 lineal feet 3 -inch pipe.
- 3,520 lineal feet 1¼-inch pipe.
- 406 lineal feet 1 -inch pipe.

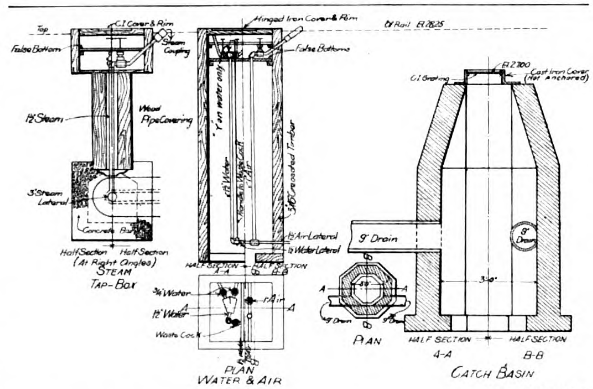
All the piping work was installed by the American District Steam Company of Lockport, N. Y., who have cooperated with the railroad in its efforts to produce a plant thoroughly up to date, and which aimed to insure the minimum expense for maintenance. The American District Steam Company have made many installations of steam heating plants, but prior to this contract had not had any experience in equipping coach yards; but it may be said that their principles were directly applicable to this style of construction, and that they have been of material assistance in working up the general scheme.

In the 3-inch fire protection laterals there are placed 13 fire hydrants. The 6-inch water service main is so designed that it can be connected to by the city fire department, the fire engines making connections on each side of Fifty-first street by means of Siamese fittings. A total of four fire engines can supply pressure to these 6-inch mains by means of two hydrants, which were placed in Fifty-first street, connecting with the city water main. In addition, in case more engines are required, they can string their hose from a distance and bring more water into play. In order that pressure from the fire engines may not be lost by pumping into the water tank or into the power plant, a swinging check valve is provided just south of the water tank, connecting with the 6-inch main, which will confine the excessive pressure to the yard alone. This plan of putting the water service main into double duty resulted in a considerable saving in cost.

It is proposed to utilize the conduit for its entire length as a portion of the system between Polk and Eighty-third streets for carrying wires for power, light, telegraph and telephone. The conduit will be equipped with hangers properly insulated, so that no electrolysis or induction may result. Contracts have been entered into with the Safety Car Heating & Lighting Company for supplying the necessary



CHICAGO & WESTERN INDIANA COACH YARD—SECTION OF CONDUIT.



THE RAILWAY AGE

CHICAGO & WESTERN INDIANA COACH YARD—CATCH BASIN, ETC.

Pintsch gas for charging the tanks in the coaches for lighting. They have connected the coach yard with their main and have put distributing pipes in the yard with tap boxes 90 feet apart serving every other track.

It was not deemed advisable to build the power plant on sand fill, so that it was found necessary to go below the original surface for a good footing. Furthermore, in view of the fact that the Monon, which has its yard immediately west, did not form its plans for elevation, it was necessary to keep the foundation below its tracks. It was thus possible to utilize the distance from the original surface to the final grade as a portion of the building. As the lower part will be surrounded with sand fill, it was necessary to make the retaining walls and foundations of concrete, with a batter having a width of base 40 per cent of the height. The stack has a foundation which is independent of the foundations of the building and is built on piles. The area of the base is figured to carry 2,700 pounds per square foot. This includes the weight of stack and effect of wind pressure. Machinery foundations are monolithic Portland cement concrete. Their foundation slabs are placed on level with retaining wall foundations, the foundations proper set back 2½ feet from edge of slab and rise vertically to the bed of the engines. The power plant has been so designed that the boiler and engine capacity can be doubled, and also that the water tank can be increased 50 per cent. The turntable is 75 feet long and is designed for 142-ton locomotives.

MOTOR-DRIVEN MACHINE TOOLS.

Motor-driven machine tools is a subject which is frequently discussed, and the latest information obtained from such discussion indicates that individual drive is rapidly growing in favor, even for rather small machines. The question of single or multiple voltage for variable speed does not appear to be settled. The controllers for machine tool motors have been made heavier and more substantial, and most of the faults of the older types have been eliminated. The Journal of the Franklin Institute for November, 1904, reports a discussion on the "Individual Operation of Machine Tools By Electric Motors," covering 30 pages, from which we extract the following:

A perfectly frank and intelligent treatment of each individual case is necessary, and one equipment yielding a proper return is a better advertisement than a dozen "show plants." Those who do not comprehend fully the situation, through lack of experience in industrial work, frequently attach a certain amount of mystery to the motor drive, but manufacturers who count on a certain return from every dollar invested for betterment or extension are not greatly interested in advantages so subtle that they cannot be defined.

The shop manager who does not see clearly the inability of a belted tool to attain maximum output, and the reasons, cannot hope to gain appreciably by purchasing a motor. A motor-driven shop does not insure low cost of production any more than efficient guns can guarantee a naval victory. The intelligent direction of work involves many more factors than most shop men realize, and hence we find success of the same degree, as far as earning power is concerned, resulting from innumerable causes. The plant with the most modern equipment may not profit by it to an appreciable extent, but nevertheless pays large dividends because the selling organization is under the direction of one possessing an exceptionally keen insight into the motives of prospective purchasers.

If the average shop manager had the information at his disposal, and the time and facilities to enable him to properly equip such old machines as would justify it and intelligently purchase new ones, the problem would be a comparatively simple one. This is true in some establishments, those of machine tool builders for example; but we cannot expect those in charge of large repair shops for railroads, collieries and other industries to have either the time or experience to conduct this work properly. Considering the rapid development in this field, much work already completed has been handled as creditably as could be expected; but, at the present time, nearly all the principal electrical companies are giving much thought to this subject that they may meet the requirements of their customers to the best advantage.

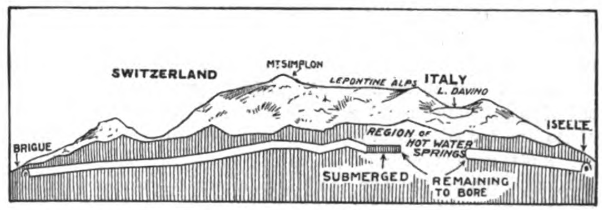
It is to the advantage of any machine shop to put an individual motor on a 16-inch lathe, provided this tool is busy throughout the shop year; that is, keeps one man busy all the time on a variety of work. It is advantageous to put an individual motor on all variable-speed tools which are busy throughout the shop year, regardless of their horsepower requirements. It is also to be deduced that since no credit has been allowed for shafting or motors allowed for group driving, it will actually pay to change existing shops to individual motor drives.

The more general appreciation of the individual drive through a better understanding of shop requirements, and the realization on the part of the machine builders and electrical companies of the need for thorough cooperation, is rapidly placing this work on a firm footing that is in marked contrast to its position a few years ago.

Not very long ago many hesitated to assert definitely that the motor drive had come to stay, while to-day it is only a question of what kind of motor drive. It may be confidently stated that the individual drive will soon be adopted for even very small machines, and, indeed, figures concerning the output of a number of the leading machine builders can leave little doubt as to the growing popularity of individual driving.

The Simplon Tunnel.

United States Consul Monaghan, Chemnitz, Germany, in a recent report says that the Simplon tunnel has met with no end of obstacles during its course of construction. It will be 12½ miles long when finished, the longest tunnel in the world. Its altitude above sea level (2,310 feet) is much lower than that of any other Alpine tunnel, which accounts for its great length. The Arlberg is 6¼ miles long and 4,300 feet above sea level. Work was started in August, 1898, simultaneously from the Swiss and Italian sides. All the workmen (10,000) are Italians, 4,000 beginning work at Brigue, Switzerland, and 6,000 at Iselle, on the Italian side. It was believed that the rocks were composed of vertical strata, but they proved to be horizontal on the Italian side. Great streams of water were met which it required much energy to turn aside. After this difficulty had been overcome the engineers came upon a bed of moving sand, which threatened to fill the shaft already drilled. Enormous wooden supports were used to stem its rush, but they went to pieces under the pressure and were replaced by steel stays to hold up the metal plates to keep out the sand. Last, but not least, hot springs were encountered.



SECTION OF SIMPLON TUNNEL.

The rock through which the tunnel is being driven is mostly granite. By the adoption of the so-called Brandt drill the galleries on the Swiss side were advanced some 20 feet daily, and often more, an unprecedented result. The Brandt drill, which is 3 inches in diameter, rotates slowly and is kept at its work by a hydraulic pressure of 1,500 pounds to the cubic inch, or 10 tons on the cutting face of the drill. The waste water is discharged along the axis of the tool, and in this way the tool is kept cool and the rock cut away is washed out. The entire undertaking consists of two parallel single tunnels 56 feet apart, which are connected at every 300 feet by transverse galleries. By means of these galleries one tunnel will ventilate the other.

The workers in the tunnel are supplied with 58,000 cubic feet of air per minute, spray and ice arrangements being introduced for cooling the air. The water discharged from the north and south ends of the tunnel by means of drains cut in the rock amounts to 5,000 gallons per minute.

Reporting on this same subject, United States Consul Horace Lee Washington writes from Geneva, as follows:

"Since September 6, 1904, when hot springs were met with on the southern side, only 111½ feet have been tunneled in the first gallery up to December 20, 1904. There remain 689½ feet to be tunneled. This will be operated entirely from the southern side, boring in the northern side having been abandoned since May, 1904.

"The difficulty, according to the chief engineer in charge on the southern side, who has courteously furnished this information, arises from the fact that at the point of contact with the hot springs the rock is of a cretaceous formation, and therefore being not solid the boring is necessarily retarded, since greater precautions are required for the safety of the workmen. A further and even more serious difficulty to surmount is the impossibility of men continuing at work beyond 30 minutes at one time on account of the excessive heat created by the hot springs, which throw out about 18 gallons per second, with a temperature of 115 degrees Fahr. in the first gallery."