IMPROVED METHOD OF TUNNEL BUILDING.

THE MORE TUBES NEW-YORKERS BUILD, THE MORE EXPERTS FIND OUT ABOUT THEM.

Duncan D. McBean, whose novel methods of carrying the subway beneath the Harlem River have attracted much attention recently, talked freely to a Tribune reporter about his plans, going into the minutest details concerning them. In the course of the conversation, Mr. McBean made this startling announcement:

"I can start to build a tunnel under the East River or under the North River by my method five years after work was begun on the first, and after it shall have been begun by the Pennsylvania Railroad on the second, and finish my tunnel before the other is completed. Besides, by my method, I can provide a system of outside drainage for a tunnel impossible in the shield method of construction, that would go far toward preventing possible accidents, and I could supply a foundation far more secure than any contemplated in the plans for any of the tunnels now under construction or soon to be begun, and I could insure perfectly true grades and perfectly aligned walls where they cannot be secured by any of the older methods. I could raise the level of the East River tunnel thirty-five feet above that contemplated in the present plans, eliminating a 3 3-10 per cent grade from pier line to pier line and making the length of the lowest level so great that a possible disaster from a comparatively small quantity of water settling to the low point, as the present plans fix the grade, could not happen. The elimination of this grade alone would save annually in the cost of the operation of the tunnel railroad 3½ per cent on a permanent investment of $4,500,000. My plan would allow me to start at the pier line grade of the East River tunnel, as now planned, and carry it across the river on a level, whereas the present plans contemplate a grade from each pier line to the centre of the stream of 3 3-10 feet in every hundred."

It is apparent by the accompanying diagram that a quantity of water that would entirely fill the 15 foot 6 inch tunnel for a train length at the centre would, if distributed over the distance from pier line to pier line, fill only about one-tenth of its space, affording a possibility of escape to those on a train running into such an accumulation, by Mr. McBean's plan, provided the electric conductors are above the level of such a flood, whereas by the present plan the same quantity of water would fall to the low point at the centre and cause certain disaster. Mr. McBean's plan, also, he asserts, would allow the drawing off of such an accidental flood through outside drains, impossible to be built in a tunnel constructed by present methods. Mr. McBean also asserts that, in addition to the saving and safety resulting from this change of grade, and the gain in time of construction, the cost of building the tunnels would be greatly reduced by his plan.

In building the west half of the tunnel under the Harlem Mr. McBean departed from all previous tunnelling methods under water. Briefly put in plain English, he dredged his tunnel and walled it with heavy timbers under water, and then, having cut off the top of the wall evenly to grade, let down upon it a timber roof of sufficient strength to resist the weight of the water above, pumped out the water within the chamber thus formed, and let in air at a pressure just sufficient to counterbalance the water pressure, as is required in all subaqueous workings, laid his concrete foundations and built the permanent tubes of cast steel and encased them in concrete, as the specifications required.

In building the east half the same plan will be pursued, except that the expensive temporary roof of timber will be dispensed with, and the upper halves of the permanent cast steel tubes, with their concrete casings, will be substituted for it. These half tubes will be built on pontoons, the concrete casings will be added, they will be floated into place over the dredged and timber sheathed channel and sunk upon these walls, so that flanges at their edges rest on steel covered timber ends. These flanges will be bolted into place by divers, and the naturally compressed air in the sunken arches will form a working chamber for cleaning out the lower half of the ditch, for laying the concrete foundations and for casing and bolting into place the remaining segments to complete the tubes. Of course, as the depth of the working is increased additional air pressure to keep out the water and mud will have to be supplied by compressors, but the original working chamber will be the air space within the arches of steel when they are sunken, less the slight encroachment of water at the bottom, due to compression as the arches are weighted down.

Several knotty problems presented themselves in making a practical application of this plan. Any gas under pressure is prone to shift its position freely as a result of the slightest change in equilibrium of the mass. One who has tried to sink an inverted basin in water knows how difficult it is to prevent a tilting of the vessel, which will allow the air to escape at one side. The longitudinal partition between the two half tubes will serve as a bulkhead to keep equal quantities of air on each side, but to prevent a possible endwise tilt, a transverse bulkhead will also be built into each arch—perhaps more than one. If deemed necessary also, the temporary sinking weights can be hung beneath the longitudinal partition, throwing the centre of gravity below the base of the double arch, and thus keeping the sinking roof on an even keel. The partition itself might be built below the spring line of the arch for that purpose, and add that much to the work of construction above water, but gaps corresponding to the transverse wallings and braces would have to be left.

The roof is to be built in three sections, the end next the east shore being placed in position first. This will be 84 feet long, and has an even grade throughout the entire length. The remainder of the 309 feet, which will have a vertically curved gradient, will be built in two equal parts. These three sections must be joined under water after they are sunk, and the manner of joining them is interesting. The end bulkhead of each section will be six feet back from the end of the wall of the tube. Out of the top of the roof in these end sections will be left three pieces, forming a hole large enough to admit a diver. He will bolt the two sections together, and on leaving the little chamber thus formed will replace the pieces, the last of which will serve as a keystone to the arch. Having covered this keystone with concrete dumped on from the pails in which it will be lowered to him, he will be drawn up, and afterward the temporary bulkhead will be removed, the compressed air will force the water out, and the keystone segment will be permanently bolted into place.

The method for cutting off piling and sheathing to grade beneath water is interesting. On each side of the channel is built on piling a strong framework, called a working platform, and on this a railway is laid, conforming exactly to the grade. A vertical shaft, bearing a circular saw at its lower end, depends from an arm extending from a sawmill on a truck resting on these rails. The saw is exactly the number of feet below the track on the platform of the subaqueous grade to be formed, and, of course, cuts the piles and sheathing to grade evenly and smoothly as it moves along a row of the timbers already driven in place.

In addition to perfection of alignment and truth of grade, both of which Mr. McBean says are almost impossible in shield tunnelling, he says that the wall of sheathing and floor supports of piling form a permanent and firm protection against washing, scouring and undermining, even in the upper stratum of the almost liquid silt which forms the river beds about New-York. The method, he says, permits the construction outside the cast steel tubing of a strong concrete foundation and wall, in which a drainage system may be created, and the elimination of deep dips beneath river beds to find a substance sufficiently firm to bear the weight of railway traffic or escape a too liquid enveloping medium, relieves the work from the horrors and liability to accident from working in air greatly compressed. The extreme depth of ninety-four feet midway between pier lines in the East River tunnel, as now planned, Mr. McBean says, calls for about the limit of working pressure. Thirty-five feet above that depth, he says, where he would lay the tunnel, the working pressure would not be dangerous.

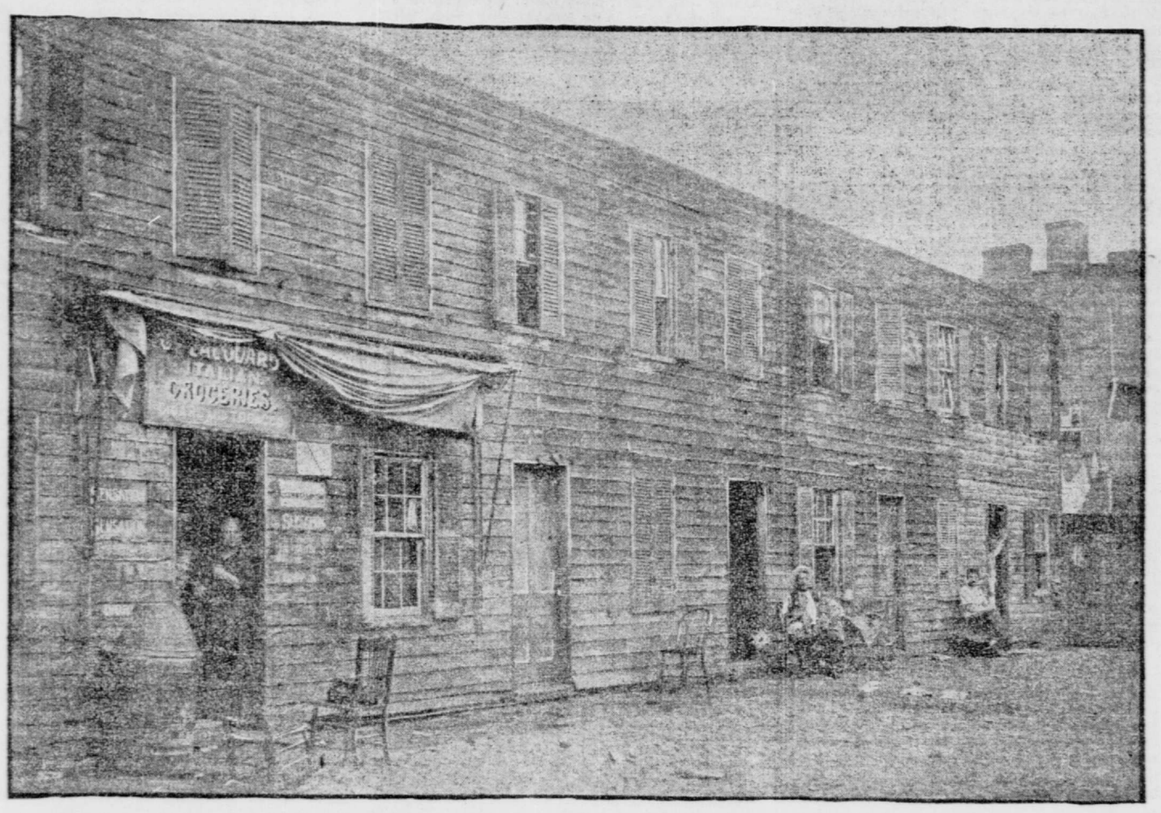
Mr. McBean has drawn plans for applying his system of construction to both the East River tunnel and the Pennsylvania Railroad tunnel, under the North River. A cross section of his plan for the East River tunnel and a cross section of the Rapid Transit Commission's plan form illustrations for this article. A comparison of the strength of the two constructions should not be difficult, even to laymen, and Mr. McBean asserts that he can save five years in construction, much of the original cost and 3½ per cent annually in the operating expenses of the railroad on a capitalization of $4,500,000.

Another advantage claimed by Mr. McBean for his method is that he can build tunnels for two or four track railroads in one channel, and at one operation, while shield tunnelling under rivers requires separate tubes for the tracks far enough apart to obviate the possibility of injury to one tube by the excavation for the other.

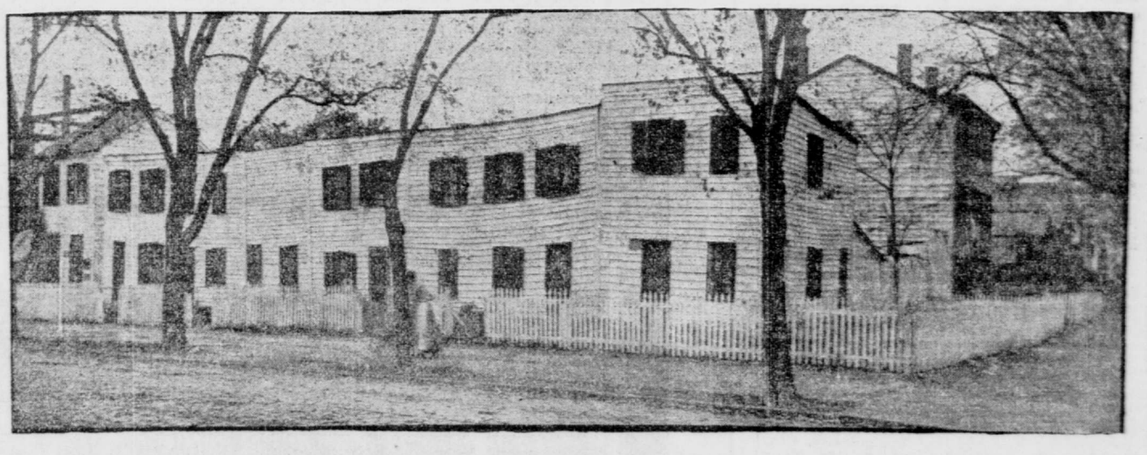
Work on the roof of the 84-foot section of the Harlem River tunnel will be begun in about a month, and the other two sections will be built practically at the same time. All will be sunk before the final work of construction within either is begun.

In view of the fact that the plans for building the East River tunnel contemplate its completion in two years, Mr. McBean's statement that he can begin five years hence and finish his tunnel first is regarded as somewhat startling. The method in use by the contractors there is said to be the same as that employed in the old North River tunnel, work on which has been in progress a part of the time for twenty years, and one tube of which is not yet finished, although several corporations have been bankrupted by the undertaking.

Mr. McBean says that by his method tunnels for street crossings under the Harlem and Spuyten Duyvil Creek can be constructed more quickly and cheaply than bridges.



"LITTLE" ITALY, AT THE FOOT OF THE CAPITOL IN WASHINGTON, D. C.



ROW OF TENEMENTS ADJOINING THE CAPITOL GROUNDS IN WASHINGTON, D. C.

MOUNTAIN OF SALT.

The Salt Mountains of Cardona, Spain.

The mountain possesses, however, one formidable foe, who slowly, but relentlessly, gnaws it from the inside. Scattered about in the mountain are tiny openings—"monkey holes," they are locally styled—and from out of each of these comes a rivulet, so tiny that it seems powerless to do harm. But little by little these subterranean springs drill their way through the entire thickness of the mountain, digging out long tunnels, into which the visitor may enter if he be so inclined. The guide accompanying him will begin by warning him that it is prudent for him to make his will ere doing so, since owing to the work of the destructive streams, continual salt slides occur in the narrow channels. Great blocks of salt are liable at any time to crash down upon the explorer, crushing him like a fly—the sound of one's voice, the weight of one's body on the soil being sufficient to detach them from the roof. Let the visitor, however, proceed a few steps further; from the ceiling depend stalactites of salt of immaculate whiteness, to all appearances chandeliers; the streamlet seems to flow along a crystal bed, and the drop of water hanging from the sharp point of each stalactite scintillates like a diamond by candlelight. Suddenly the guide pulls you back, calling your attention to a feeble sound akin to that emitted by a squeezed sponge; it is hardly perceptible to the ear, and yet it sounds a warning of an imminent salt slide, and it becomes imperative to retrace one's steps without having been able to penetrate further into the fairylike interior of the mountain.

The mountain of Cardona being private property, three or four gorgeously uniformed keepers are intrusted with the duty of seeing that the inhabitants of the surrounding country do not come and help themselves to salt; it is, however, an easy matter to take away a crystalline fragment by way of memento. So limpid is the substance that spectacle glasses can be made out of the more transparent pieces. The men employed at the salt works turn out crosses, rosaries, goblets and bottles, which they sell to tourists for a few pesetas.—(Philadelphia Ledger.

UNREDEEMED CURRENCY.

Government Has Gained $25,000,000 by Bills Destroyed.

The clear profit up to date accruing to the national government through the various ways of destroying paper bills is estimated to amount to about $25,000,000. This enormous sum is stored away in the vaults of the United States Treasury at Washington in the shape of gold and silver coin and bullion. When one mutilates paper money in such manner that it never can be presented for redemption, the government enjoys the useful consequences. When another demonstrates to a party of friends that he has "money to burn," by lighting a cigar with a folded dollar bill, Uncle Sam is the beneficiary of the foolish idea.

The amount can be figured approximately only, however. There is no way for Uncle Sam and his most expert financiers to estimate in certain set figures this paradoxical fund. But it is there, nevertheless, a silent factor in the shrinkage of national moneys, and cannot be touched because it is a part of the reserve or trust fund held for the redemption of the paper currency of the government. The percentage of money never redeemed and characterized as "unknown" currency is comparatively small, yet much more in the aggregate than most persons imagine.

In the United States Treasury is a cash reserve, or general trust fund, which is intended for the purpose of protecting the credit of the government and the people. In the event of a run on the Treasury, this reserve would be used for the redemption of paper currency. For each outstanding gold and silver certificate and United States Treasury note there is a like sum stored in the Treasury vaults or within command of the government. Any person holding one of these notes may present it at a government depository and receive its equivalent in coin. According to the latest monthly statement of the Treasurer of the United States there was on November 2 last $433,198,869 in gold certificates and $469,771,000 in silver certificates outstanding, the greatest sum in the history of the nation. Like amounts of gold coin and silver dollars were held for the redemption of these.

On the same day the amount of outstanding paper currency in the form of United States notes was $346,-681,016. Since 1878 this amount has been at the same level, because made permanent by law. For some years after the Civil War this was styled flat money. There was no reserve other than the credit and good word of the government to "make it good" to the people. During the first Cleveland administration $150,000,000 of gold coin and bullion was set aside as a reserve fund to protect these notes. But the same principles applicable to other paper currency are true of the United States notes which are lost or destroyed in like manner.

National bank notes are also redeemable. The act of Congress approved June 20, 1874, repealed the provision in the National Bank law requiring banks to keep a reserve against their circulating notes for redemption purposes. In lieu they were required to maintain in the Treasury of the United States a 5 per cent fund of the lawful money for the redemption of their notes, and were allowed to count this fund as a part of their lawful reserve against deposits. Any gain from failure to present national bank notes for redemption inures to the government. The November 1 statement of the United States Treasurer shows that there is $419,-610,633 now outstanding in national bank notes, the greatest amount at any time in the history of the nation.

The total amount of outstanding paper currency, through the destruction of any fraction of which the government becomes a beneficiary, is $1,686,135,-553, divided as follows: United States notes, $346,-681,016; Treasury notes of 1890, $16,874,000; national bank notes, $419,610,633; gold certificates, $433,198,869; silver certificates, $469,771,000; total, $1,686,135,569.

Expert financiers estimate that about 2 per cent of each issue of government currency is destroyed and never redeemed in each decade. The percentage of national bank currency never redeemed is theoretically a little less. Two per cent of the total amount of outstanding paper would be $33,722,711 36, the maximum gain of the government through shrinkage of paper currency. Basing this hypothesis on the most conservative basis possible—one-half of 1 per cent in a quarter of a century—the minimum gain of the government would be $8,430,-677 84—the smallest possible sum which should be in the vaults of the Treasury at the present time—a paradoxical amount, which represents a clear gain that may never be used unless the currency laws are changed, but is simply that much retired from the nation's available money, as if in a miser's strong box.

Successive Controllers of the Currency have tried to approximate the size of this fund, but have failed. There seems to be no way in which this may be determined. There is no method of absolutely ascertaining how much money is destroyed, because no one knows when Maggie is going to light the fire in the parlor stove, where Mrs. Smallhead had hidden her savings. As far back as 1875 the then Controller began compilations which have been continued at irregular periods, based upon figures of forty national banks which have failed, fifteen of them prior to 1870, eight prior to 1873, and seventeen prior to 1876. The computations were made in 1875 for those that went to the wall before that year, and in 1878, 1883, 1889 and 1900 for those that failed before 1876. The tables were based on the amount of the total issue of the bank which remained unredeemed at the time each computation was made.

The Revised Statutes require that all national banks which go into voluntary liquidation and all insolvent banks shall deposit in the Treasury an amount of lawful money equal to the amount of their circulating notes outstanding. Thus, it will be seen that no association can close up its affairs without first providing for the payment of all its circulating notes. The amount deposited must remain in the Treasury until the last outstanding notes shall have been presented for payment. By the terms of the act of July 12, 1882, the association must, at the end of three years from the date of the extension of the corporate existence of each bank so extended, deposit lawful money with the Treasurer sufficient to redeem the remainder of the circulation outstanding at the date of its extension. It also provides that any gain that may arise from the failure to present such circulating notes for redemption shall inure to the benefit of the United States, and that the new circulating notes to be issued in the place of the old shall bear such devices as shall make them readily distinguishable from the old ones.

In the Controller's report for 1875 a table gives data obtained from a series of reports of the superintendents of the bank department of the State of New-York, exhibiting the amount of notes which had been issued to State banks and the amount remaining at the expiration of the six years' notice required to be given by the banks, before they were by law relieved from the obligations to meet them. Returns were in this way obtained from 286 banks, either incorporated or organized under the safety fund or under the free banking system of the State of New-York.

The maximum amount of circulation issued to them was $50,754,519, and the amount of unredeemed circulation was $1,336,327, or 2.63 per cent of the highest amount issued. The amount of circulation issued to 240 State banks in Wisconsin was $7,565,409, and the amount unredeemed was $134,747, or 1.78 per cent. The maximum issue to 210 State banks in the six New-England States was $39,245,380, while the amount remaining unredeemed was $792,767, or 2.02 per cent. In the report of the Controller in 1882 the statement was made that the returns from 322 State banks in New-York, New-Jersey, Delaware and Maryland show their maximum circulation to have been $85,644,176, while the amount unredeemed was $1,707,428, or a percentage of 2.60. The percentage of unredeemed notes of twenty-five State banks of Ohio having a circulation of $2,196,-381 was 2.79. The greatest amount of circulation issued to 707 State banks in twelve States was $114,671,346, the amount outstanding $2,696,282, and the proportion unredeemed 2.4 per cent.

From these figures it may be seen that a maximum estimate of 2 per cent is not extravagant, and that the minimum estimate of one-half of 1 per cent is extremely conservative.

The actual figures of the forty State banks which failed prior to 1876 and which were last officially computed, showed that 74 per cent was outstanding in that year. The various tables regarding these banks which have been recapitulated in the office of the Controller have been compiled from various sources into one comprehensive table, covering the whole period, showing the total circulation and the percentage of unredeemed notes at various periods, as follows:

	Circulation.	Percentage unredeemed. 1875.	1878.	1883.	1889.	1900.
15 failed before 1870	$1,554,400	1.39	.86	.60	.45	.39
8 failed before 1873	1,642,293	6.70	2.66	1.47	.93	.74
17 failed before 1876	3,136,876	41.81	9.76	2.91	1.36	.90
40 banks.	$6,333,569	23.06	5.79	1.98	1.02	.74

The fifteen banks which failed before 1870 were the First National Bank, of Attica, N. Y.; Venango National, of Franklin, Penn.; Merchants' National, of Baltimore; First National, of Medina, N. Y.; Tennessee National, of Memphis; First National, of Selma, Ala.; First National, of New-Orleans; National Unadilla, of Unadilla, N. Y.; Farmers' and Citizens' National, of Brooklyn; Croton National, of New-York; First National, of Bethel, Conn.; First National, of Keokuk, Iowa; National Bank, of Vicksburg, Miss.; First National, of Rockford, Ill.; First National, of Austin, Nev.

The eight which failed prior to 1873 were the Ocean National, of New-York; Union Square National, of New-York; Eighth National, of New-York; Fourth National, of Philadelphia; Waverly National, of Waverly, N. Y.; First National, of Fort Smith, Fort Smith, Ark.; Scandinavian National, of Chicago, and the Wallkill National, of Middletown, N. Y.

The seventeen which failed prior to 1876 were the Crescent City National, of New-Orleans; Atlantic National, of New-York; First National, of Baltimore; National Bank of the Commonwealth, New-York; Merchants' National, of Petersburg, Va.; First National of Petersburg, Va.; First National, of Mansfield, Ohio; New-Orleans National Banking Association; First National, of Carlisle, Penn.; First National, of Anderson, Ind.; First National, of Topeka, Kan.; First National, of Norfolk, Va.; Gibson County National Bank, of Princeton, Ind.; First National Bank of Utah, Salt Lake City; Cook County National, of Chicago; First National, of Tiffin, Ohio, and Charlottesville National, of Charlottesville, Va.

TO RELIEVE WASHINGTON OF SLUM CONDITIONS

REGARDED AS DISGRACE TO NATIONAL CAPITAL—CONGRESS ALONE CAN ACT.

Washington, Dec. 26 (Special).—The national capital has for years been content with the magnificence of its public buildings and private dwellings, and has endured its shabby and disreputable business houses and tenements as one of the inevitable conditions of life, even the filthy and disreputable surrounding of the great marble Capitol itself being a disgrace to decency and a menace to safety and health.

But at last Jacob Riis, of New-York, has caused Washington to wake up from her Rip Van Winkle sleep and made her citizens believe that this is one of the filthiest cities on the American continent and that the necessary campaign of deodorization and disinfection must begin at once. Mr. Riis gave it out publicly that he never dreamed that such a condition could exist within the city of Washington; that he found filth and foulness right under the noses of the lawmakers, while hidden back in the blind alleys of the city were sights which would make the residents of the worst portion of London blush for shame.

Mr. Riis spoke the truth, and the fact has been known to the good people of Washington for many years, but there was no way for relief save through action by Congress, and this was difficult to get. There seems now a determination on the part of the District Commissioners, who are substantially backed, to have laws enacted which will clean out, tear out, burn out or get out in some other way the buildings and hovels which almost hem in the great building on the hill. The main approach—Pennsylvania-ave., the chief boast of the city, extending from the Navy Yard to Georgetown—has been called a disgrace to civilization. The broad and splendidly paved avenue is lined with low saloons, cheap boarding houses, shoes-half-soled-while-you-wait shops, shooting galleries, Chinese chop suey houses, second hand stores, junk shops, three-cent lunch rooms, and houses of even worse character.

Perhaps in no city could be found a public street of more disreputable surroundings than this "Washington Bowery." Many of the buildings are thoroughly unsanitary and unsafe, but the owners decline to repair, for the rents are always good and a shack is seldom vacant. On the "Bowery" can always be found an ever changing panorama of human nature. Men of all sizes, shapes and conditions mingle promiscuously together. Well dressed men and ill dressed men, men of intelligence and stupid ones, old and young, foreign and native, white and black, all mixed up in a general jumble, and, of course, there is not an entire absence of the other sex. Cheap whiskey, cheaper eating, cheapest lodgings, make this vicinity a favorite place for men and women of slanting reputation. The color line is not drawn to any extent, and any one is a good fellow so long as his money holds out.

Just off Pennsylvania-ave. and immediately at the foot of the front of the Capitol grounds is "Little Italy," as thoroughly uninviting a part of the city as one could imagine, and where poverty, misery and vice hold high carnival among the worst element of the unfortunates who claim it as their place of abode. There is only one redeeming feature in "Little Italy"—the little children can take refuge in the Capitol grounds and get out of their miserable surroundings. In the boasted civilization and refinement of the nation's capital it is difficult to imagine how such conditions can be tolerated under the very shadow of the Capitol dome. In "Little Italy" there is every evidence of filth—positive, comparative and superlative. The modern Italians, like the ancient Romans, seem to be a race with outstretched hands, and believe that the world owes them a living without the "sweat of the brow," and the spur of want is the only thing which will give them provocation to work.

But this "Little Italy" is only one of the three hundred blind alleys of Washington which Mr. Riis visited, and which, he says, discounted anything he had ever witnessed or investigated elsewhere. There are just as bad all over Washington, and the moral tone is even worse in most of them. Chinatown, south of the avenue, and not far removed from "Little Italy," is populated almost entirely by the Celestials, and they have been there so long that the residents of Washington pay little attention to them, and seldom think of them save when the police make a raid and run in a wagon load of them for playing policy or fantan. Chinatown is a model quarter compared to some of the other localities where the white and black live and mix indiscriminately.

A Congressman who is much interested in Washington, and who took kindly to Mr. Riis and his work here, in speaking of the outlook for action by Congress, said:

"I have been in Congress several years, but I never dreamed that right here within the sound of speechmakers such conditions existed. I am ashamed to say that we are simply surrounded with filth, disease and vice. Why, even some of the apparently respectable houses are the homes of rolled doves. They are getting pretty bold when they leave the 'Tenderloin' and camp right at the Capitol grounds. Back in the alleys the houses are nothing more than shacks, in which are housed whites and blacks, with every element of disease and crime breeding.

"If Mr. Riis has succeeded in opening the eyes of our people, he has done a great work. It is high time for some heroic measures to be adopted, and I believe that when Congress is shown the condition of affairs there will be something doing without any ceremony."

DEATH BY LIGHTNING.

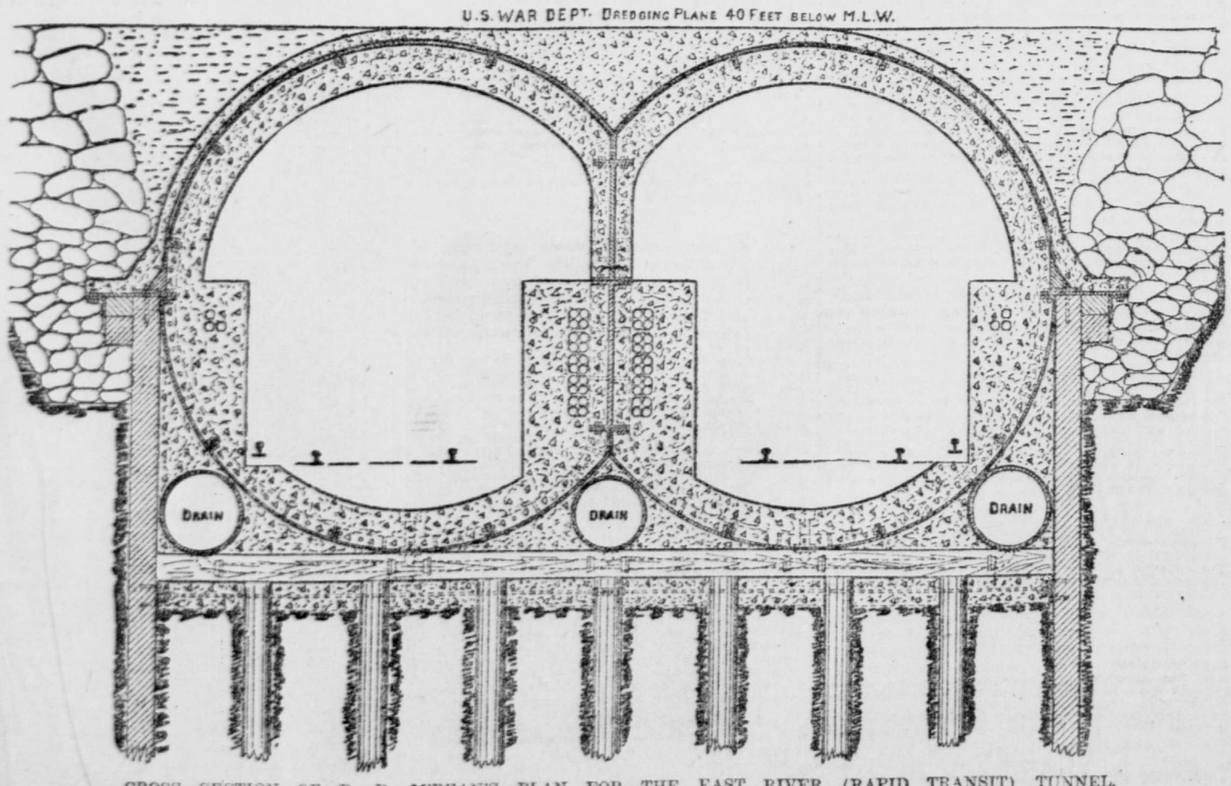
Over Seven Hundred People Killed This Way Last Year.

As near as may be determined, 713 persons were killed by lightning in the United States in 1900, and between 700 and 800 are probably killed each year. East of the 100th meridian thunderstorms occur all over the country, but west of it, except in the Rocky Mountains, the frequency of storms diminishes until on the Pacific Coast there are practically none. The greatest number of storms occurs in Florida, in the middle Mississippi Valley and the middle Missouri Valley. The average number of storms in each in 1900 was 45, 35 and 30, respectively. The greatest number of deaths in any single State (1896-1900) was 188—in Pennsylvania. Ohio came next with 135, Indiana, Illinois and New-York having 124 each. As to city and country, the more dense the population the smaller the rate to the 1,000,000 of population, due, of course, to the fact that the territory of the country is far greater than that of the city. Beside this, the metal roofs, telegraph wires, etc., of the cities serve as conductors. Lightning rods, as usually put up, are of no use. A tin roof with gutter spouts leading into the ground is much more effective. Barns with green hay seem to invite lightning. Maple and cottonwood trees are struck much more frequently than oaks, these much more than beeches. Trees are surely a poor place for shelter, and feather beds are not disliked by the stroke.—(Topeka Capital.

DIMENSIONS OF NOAH'S ARK.

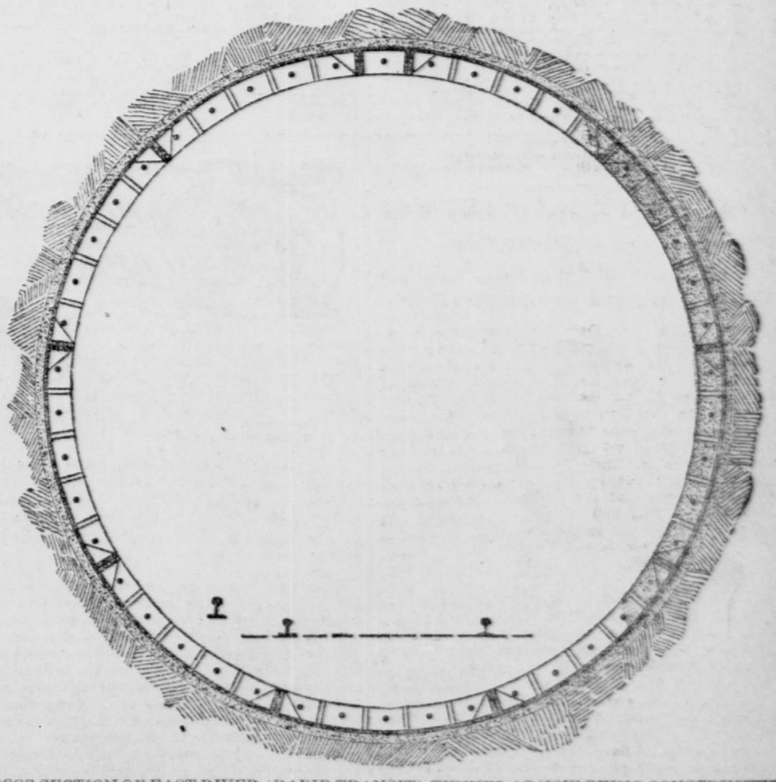
As in the case of the story of Jonah and his brief but intimate acquaintance with the whale, questions have been raised about the authenticity of the story of the trip of the first houseboat, the ark. Was it possible to construct a vessel having the reputed capacity of that famous craft? What were its dimensions, anyway? These questions have buzzed in the head of more than one "old subscriber" and "constant reader." The Editor of "The Syren and Shipping" has undertaken to answer these questions and to lay for all time any doubts as to whether the writer of the story of the Deluge was ignorant of the subject of shipbuilding.

"Within the last ten years," he says, "the general dimensions of the ark have been closely followed by cargo steamship builders for deep sea and the American Great Lakes service. According to the Bible, the ark was 480 feet long, 80 feet wide and 48 feet deep. Her tonnage was 11,413, and she had plenty of room for pairs of all the distinct species of animals that are classed by Buffon—244—and she could have accommodated a thousand persons, and then have plenty of room for the storage of supplies. In the seventeenth century Peter Jansen, a Hollander, built a vessel of the exact proportions of the ark, and she was successful, as records of the times show, in making money for her owners. Noah, 'the Father of Naval Architecture,' is held in profound respect by naval architects of to-day, who knew how immeasurably the Phoenicians, Greeks and Romans and all other shipbuilders fell short of the excellence of the type of the ark as a commodious, safe and economical vessel."



CROSS SECTION OF D. D. M'BEAN'S PLAN FOR THE EAST RIVER (RAPID TRANSIT) TUNNEL.

He proposes to construct both tubes in one excavation, and with a thick outer envelope of concrete, all supported by sheathing and piles, affording space for drainage outside the tubes and permitting the tunnel to be constructed with thirty-five feet less grade than the present plans require, thus diminishing the pressure vastly. Diameter of tube, 15 feet 6 inches.



CROSS SECTION OF EAST RIVER (RAPID TRANSIT) TUNNEL AS NOW BEING CONSTRUCTED.

This shows a comparatively thin outer envelope of concrete or grout. A segmental steel tube 1¼ inches thick, with 1½ inch metal ribs inside. Spaces between metal ribs are also filled with concrete. The support for the tube is the natural material of the river bed. Inside diameter of tube, 15 feet 6 inches. A twin tube parallels this at some distance.