H. J. WESSINGER.

MINE SHAFT LINING.

APPLICATION FILED APR. 13, 1911.

996,178.

Patented June 27, 1911.

2 SHEETS—SHEET 1.

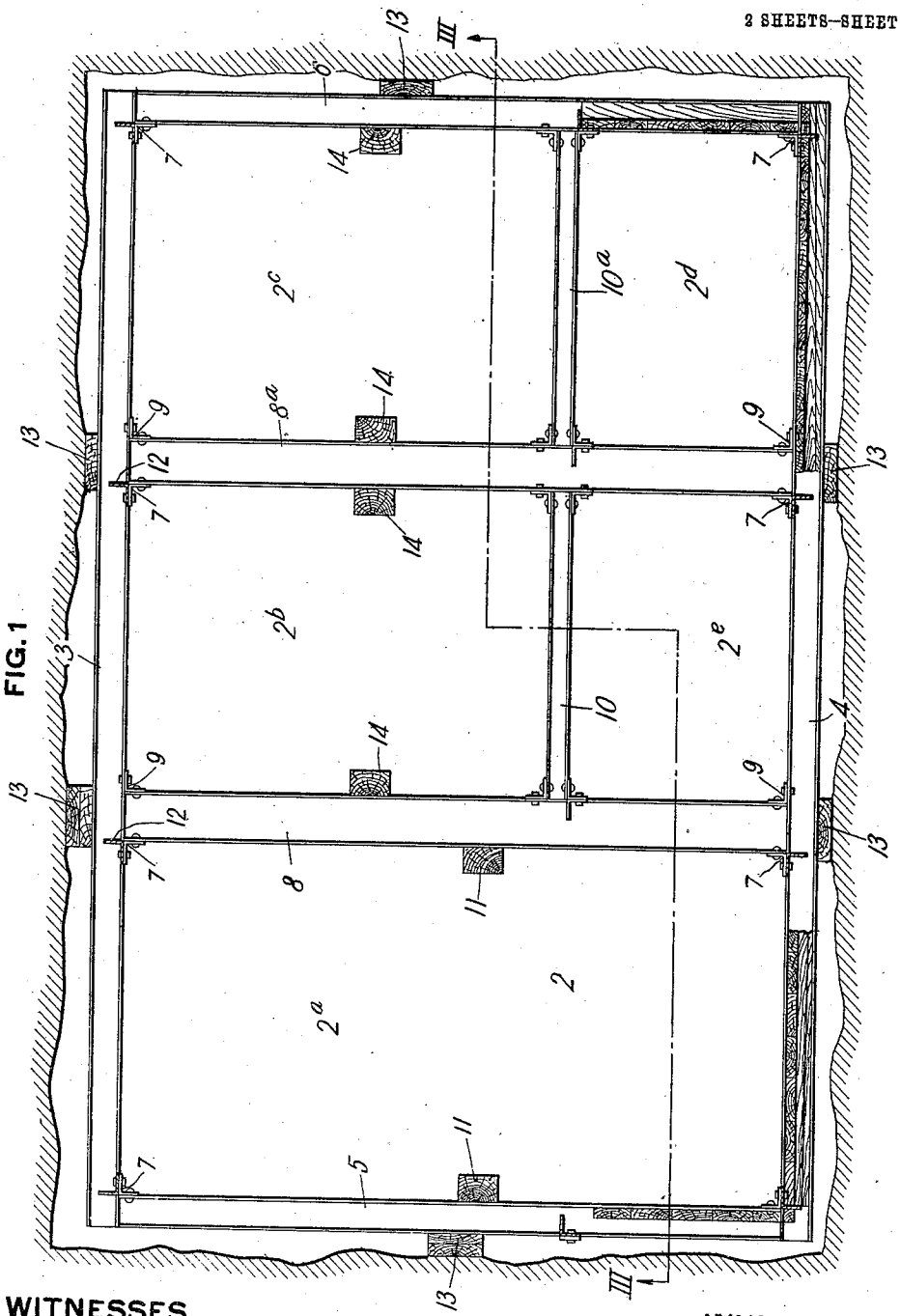

FIG. 1

WITNESSES

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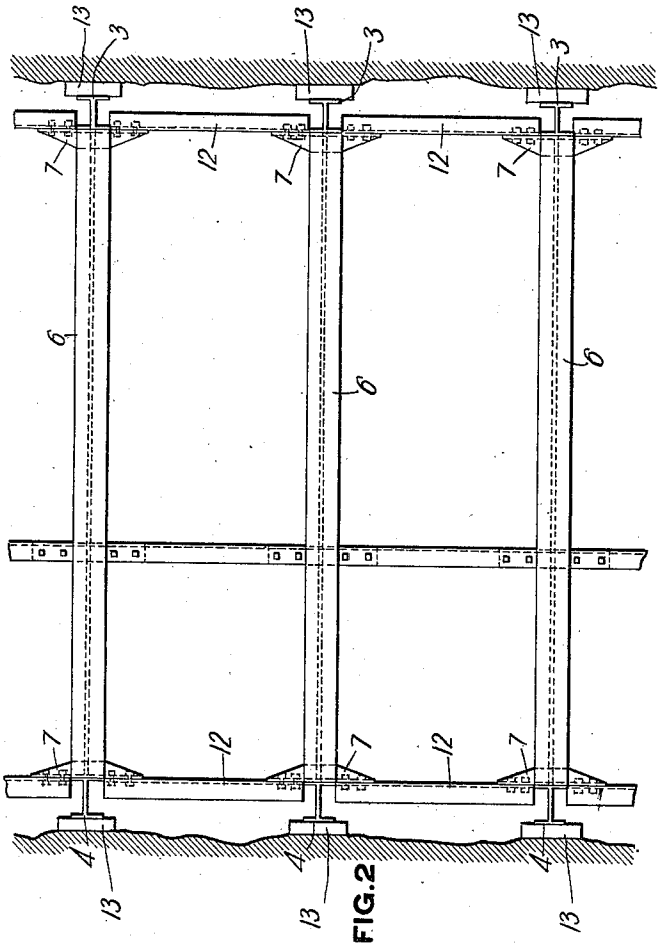

FIG. 2

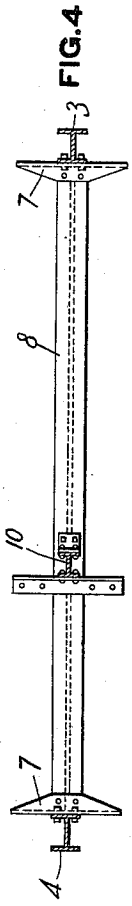

FIG. 4

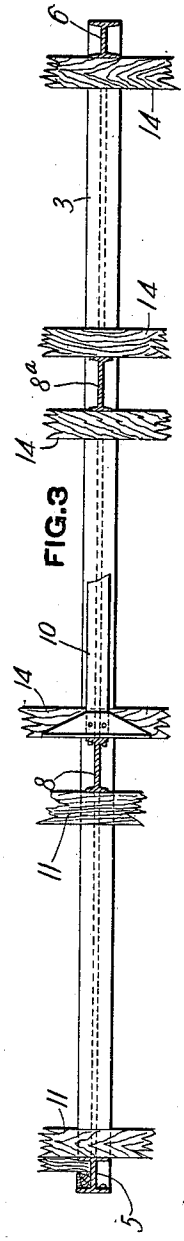

FIG. 3

WITNESSES

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UNITED STATES PATENT OFFICE.

HENRY J. WESSINGER, OF DULUTH, MINNESOTA.

MINE-SHAFT LINING.

996,178. Specification of Letters Patent. Patented June 27, 1911.

Application filed April 13, 1911. Serial No. 620,949.

To all whom it may concern:

Be it known that I, HENRY J. WESSINGER, of Duluth, in the county of St. Louis and State of Minnesota, have invented a new and useful Mine-Shaft Lining, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to the means employed in lining the shafts of mines, and one object of the invention is to provide a lining for such mine shafts having novel means whereby the lining is secured in position in the shaft while being erected and is maintained in place in the shaft after being erected.

Another object of this invention is to provide a mine shaft lining constructed substantially wholly of fire proof material and forming a lining of much greater durability and largely increased strength over that obtained with the constructions heretofore used.

Another object of my invention is to provide a mine shaft lining having improved means for securing in place the lagging used in lining the shafts, and a shaft lining having improved means for securing the successive framing sets in alinement in the shafts.

In sinking mine shafts, it is the general practice when the excavation has proceeded to a suitable depth, to place long timbers or "bearers" across the excavation and upon these bearers erect what is termed a "shaft set," formed of four heavy timbers placed in rectangular form, and framed together at the corners with the necessary "dividers" or partition timbers, which when erected define the compartments of the shaft. One set being in place, another set is put together a suitable distance below and suspended from the first set by hanging bolts. Strut members called "stuttles" are then put into position between the two shaft sets and by means of the hanging bolts, the lower set is drawn upward until the stuttles are in compression, and as the excavation of the shaft proceeds successive shaft sets and stuttles are placed in position in the same manner as before described. When the desired depth of shaft is reached, another set of "bearers" is put in position and, when all the hanging bolts have been pulled up tight, the entire section of the shaft between bearers is in compression and the hanging bolts may then be removed. To get the successive shaft sets in perfect alinement, wedges are driven against the rock or earth excavation, each set being secured in its alined position by the wedges which are placed on all sides thereof. When the nature of the ground is such as to render it necessary, "lagging" is put in back of the sets, this lagging frequently being formed of heavy planks secured against the sets so as to prevent rock or earth dislodged from the sides of the shaft from falling into the shaft through the spaces between the sets. This method of lining mine shafts has been followed whether the sets were made of timber or of steel.

Referring to the accompanying drawings: Figure 1 is a horizontal cross section of a mine shaft showing a shaft lining constructed and arranged in accordance with my invention. Fig. 2 is a detail sectional side elevation showing the construction of the sets and the manner in which the stuttles are secured in place thereon. Fig. 3 is a detail sectional side elevation on the irregular line III—III of Fig. 1. Fig. 4 is a detail sectional elevation showing the connection between the members of the framing and a detail of the connection between the framing and the stuttles.

In the drawings, 2 designates a mine shaft having erected therein a framework comprising parallel horizontal extending beams 3 and 4, commonly known as "wall plates" which are secured at their ends to the adjoining ends of the transversely extending horizontal beams 5 and 6, usually designated as "end plates" by means of angle connections 7, one of the peculiar features of my invention being that the connections 7 are also utilized to serve as connections for the stuttles 12. Sets like that shown in Fig. 1 are provided at short intervals in the depth of the shaft, each successive set being secured to the one above it by means of the stuttles 12 which are fastened by the connections 7 to the adjoining "sets," these stuttles being rolled metal angles or of a form which will serve either as tension or compression members. The shaft as shown, is divided into five compartments, one compartment 2^a for the cage, two compartments 2^b and 2^c for the skips, a compartment 2^d for the ladders, and a compartment 2^e for the pipes leading into the mine by means of trans-

versely extending beams 8 and 8ª which are secured by connecting angles 7 and 9 to the wall plates 3 and 4 and by the beams 10 and 10ª which extend between beams 8 and 8ª and 6. Vertically extending guides for the cage and the skips are formed by means of wooden timbers 11, 11, and 14, 14, these timbers being securely bolted to the flanges of the dividers 8 and 8ª and the end plates 5 and 6 so as to be rigidly held in place.

As shown on the drawings, beams, preferably of the form known as H-sections, are used to form the wall plates and end plates, as in this beam construction the combined width of the flanges on one edge of the web equals or approximates the depth of the beam, thus providing a wide flat bearing surface for the wedges 13, which are employed to secure the shaft sets against lateral movement. The wedges 13 are securely driven between the rock and earth facing of the excavation and the wide flanges of the wall and end plates. As at times the side pressure on the mine shaft is very great, demanding great strength in the wall plates and end plates, the H-section type of beam is particularly well adapted to stand such stresses, it being the strongest section for its depth of any rolled. It is evident that the greater the width of the beams forming the side plates and end plates, the larger the excavation will have to be for a given effective area of the shaft, so that by the use of this section, the necessary strength is obtained with the minimum width, thus obtaining a maximum effective area in the shaft with a minimum size of excavation.

The angle connections 7 which serve to fasten together the wall plates, end plates and dividers, also form connections for the stuttles 12 and these stuttles being made of rolled steel angles serve as hanging bolts or tension members when the shaft sets are being put in place. After the bearers are located in position in the shaft, the stuttles act as compression members or struts, and, inasmuch as they are placed directly above one another and are secured to the angle connections holding together the members of the set, the entire shaft lining is securely tied together whether subjected to either tension or compression strains. The stuttles between any pair of shaft sets are made of exactly the same length and are secured to the angle connections in such manner that the ends of the stuttles bear upon the edge of the flange of the adjacent H-beam to which the stuttles are fastened, so that when the shaft lining is in compression, as is its normal condition after being erected in place, there is no shearing strain on the bolts or rivets.

The number of connections which have to be made when securing the various members together in the shaft is very materially reduced in the construction as shown, wherein the angle connections 7 serve the double purpose of securing the wall plates to the end plates and to the stuttles. This is an important feature inasmuch as the assembling of the parts is one of considerable difficulty and it is very desirable that the number of bolts and rivets in a shaft set be reduced to a minimum.

In the lower left hand corner of Fig. 1 one method of putting in the lagging is shown. The inner flanges of the H-beam on the successive sets afford support for the ends of the lagging while the outer flanges afford a substantial surface to wedge the lagging tightly in place. It is evident that if it is not desired to use wooden lagging, plates of steel can be employed instead of the planking shown, in the same manner. In cases where the spaces between the sets are filled with concrete, then the large flanges of the H-sections afford secure footings and means for holding the removable forms in place used with such construction until the concrete is set.

The advantages of my invention will be apparent to those skilled in the art. By the use of a shaft lining of the construction shown, the effective area of the excavation is largely increased over what has been the practice heretofore, with the customary lining, thus reducing the amount of excavation required to produce a shaft having compartments of a given size. The construction and arrangement of the parts forming the lining is such as to permit of its being readily assembled and erected in the shaft.

The peculiar features of my invention which make it particularly well adapted for the purpose, are the method of connecting the various members of a single set together; the use of one member which serves the purpose of both hanging bolt and stuttle, and the form of the steel sections used for sets which form greatly facilitates the wedging of the successive sets into alinement, and the placing of the lagging in position whether or not this lagging be of timber, steel, concrete, or a combination of steel and concrete.

Modifications in the construction and arrangement of the parts as shown may be made without departing from my invention as defined in the claims.

By employing a concrete or metal plate lagging a fireproof construction is obtained and danger from fire in the mine shaft is eliminated.

I claim:—

1. A mine shaft lining comprising successive shaft sets formed of metal beams of substantially H-section, angle connections at the ends of the beams and stuttles secured to opposite angle connections on the successive sets.

2. A mine shaft lining comprising successive shaft sets formed of metal beams of substantially H-section, angle connections at the ends of the beams, and stuttles formed of angles and secured to the corresponding angle connections of successive sets.

3. A mine shaft lining comprising successive shaft sets formed of metal beams of substantially H-section, angle connections at the ends of the beams, stuttles secured to opposite angle connections of successive sets and lagging interposed between the flanges on opposite marginal edges of the beams forming the successive sets.

4. A mine shaft lining comprising successive shaft sets formed of metal beams of substantially H-section, angle connections for securing the ends of the beams, and stuttles of angle section removably secured to the angle connections, the ends of the stuttles being arranged to contact with the flanges of adjacent beams.

5. A shaft set comprising metal wall plates and end plates of substantially H-section and angle connections securing the wall plates to the end plates, said angles serving as connections for stuttles interposed between adjacent shaft sets.

6. A mine shaft lining comprising lagging in engagement with the earth sides of the mine shaft, rectangular frames formed of metal beams secured together at adjacent ends to hold the lagging in place, said frames being horizontally disposed at separated intervals in the depth of the shaft and a series of stuttles formed of rolled steel angles to maintain the frames in separated position, said stuttles being adapted to support the frames in assembled position during the erection of the shaft lining.

7. In a mine shaft lining, the combination with the lagging of a series of rectangular frames formed of rolled steel beams and arranged horizontally at intervals in the depth of the mime shaft to maintain the lagging in place and a series of stuttles formed of rolled steel angles between the frames to connect adjoining frames and arranged to support and maintain the frames in spaced apart relation.

8. In a mine shaft lining, the combination with the lagging of a series of rectangular frames formed of rolled steel beams and arranged at intervals in the depth of the shaft to engage with and hold the lagging in place and a series of stuttles formed of rolled metal angles between and arranged to connect and secure adjoining frames together in place in the shaft, said stuttles being removably secured to the frames.

9. In a mine shaft lining the combination with the lagging of a series of horizontally disposed hollow rectangular frames formed of rolled steel beams secured together in place, the lagging in said shaft being secured in place between the flanges on opposite marginal edges of the beams.

In testimony whereof, I have hereunto set my hand.

HENRY J. WESSINGER.

Witnesses:
ALEX. M. GOW,
EDW. B. RYAN, JR.