Jan. 24, 1933. I. O. MINER 1,895,292

CLIPPER

Filed April 24, 1931. 2 Sheets-Sheet 1

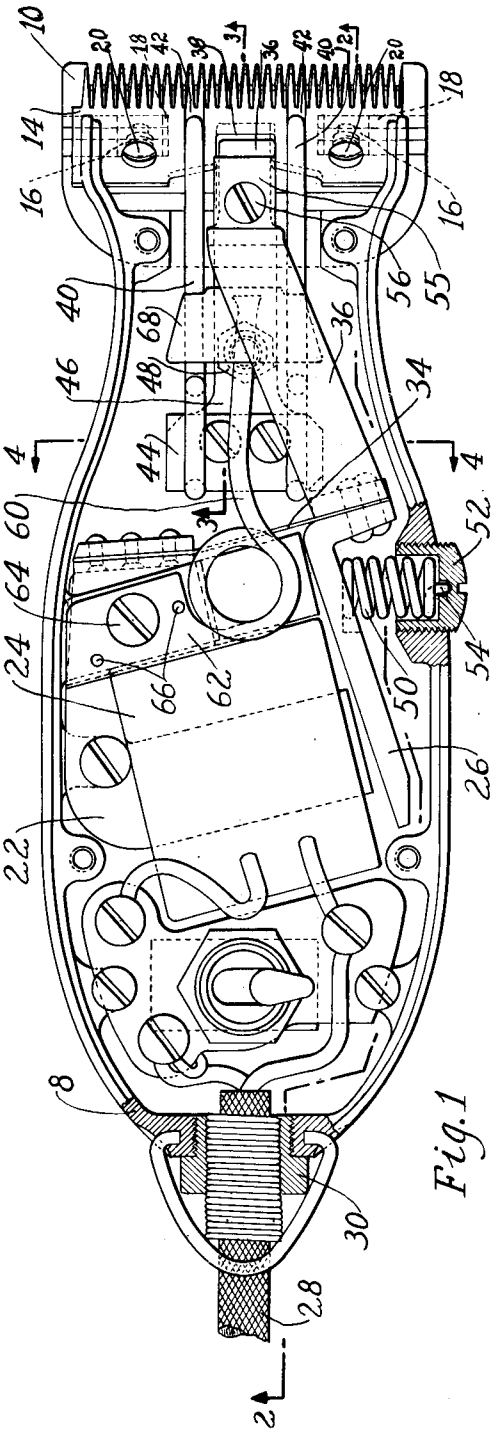


Fig. 1

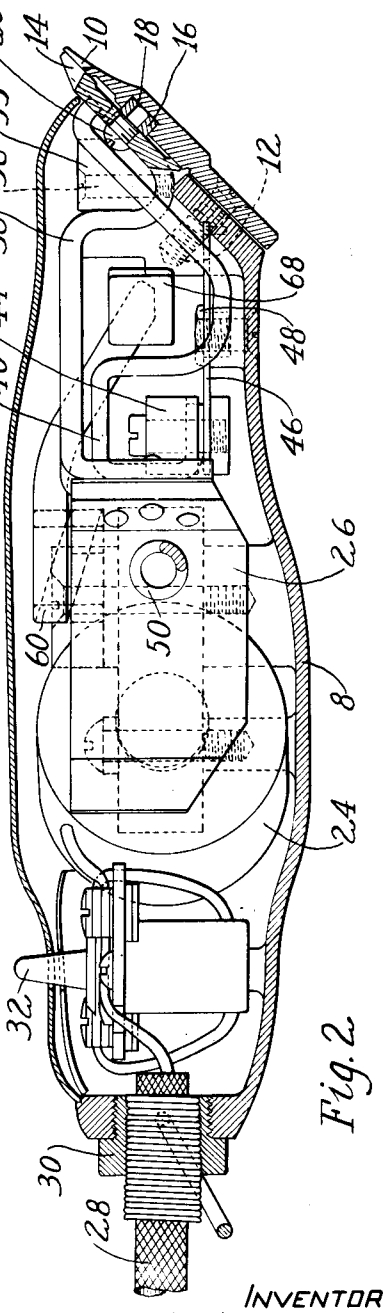


Fig. 2

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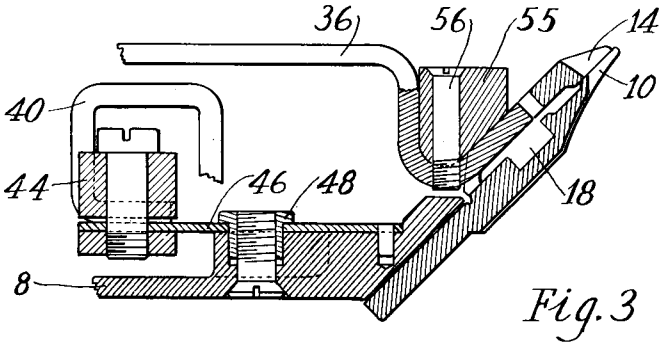


Fig. 3

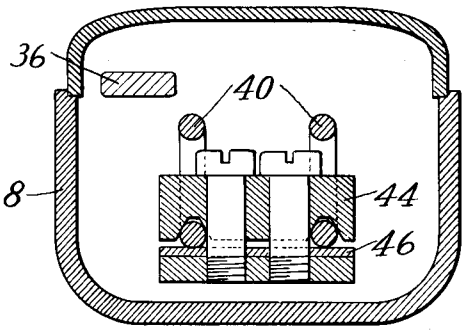


Fig. 4

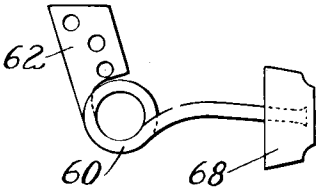


Fig. 5

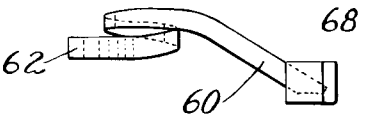


Fig. 6

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UNITED STATES PATENT OFFICE

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CLIPPER

Application filed April 24, 1931. Serial No. 532,458.

The invention relates to a clipper, and more particularly to a hair clipper in which one blade is given a vibratory movement relatively to a stationary blade to produce a substantially continuous cutting action of the two blades.

In a clipper of this description which may be driven automatically at a high rate of speed by some form of electric motor, as for instance, where the impulses impressed on an electromagnet by an alternating current are utilized to secure a rapid oscillation of a spring-pressed armature relative thereto, the vibratory movements of the moving blade and the driving connections therefor tend to set up a corresponding vibration of the casing which has been found to be extremely objectionable.

It is one object of the present invention to eliminate this vibration of the clipper casing or support induced by the vibratory movements of the moving parts, and thus to provide a clipper which will be more satisfactory and successful for practical use than those previously produced.

It is of the utmost importance in a vibratory hair clipper of the general type herein disclosed, in order to secure its satisfactory operation under the varying conditions of commercial use, that a stable condition be maintained at all times in the adjustment of the natural period and amplitude of vibration of the vibrating system, consisting of the movable blade, the armature and the tuning springs, with relation to the frequency of the driving impulses of the alternating current. Inasmuch as the tuning of the system must depend on the strength of the tuning springs with relation to the weight or mass of the elements controlled thereby, it is necessary in adjusting the tuning of the vibrating system to take into consideration the weight and tendency to vibrate of the casing or handle of the clipper. From actual use, it has been demonstrated that this adjustment in the tuning of the clipper is considerably affected by the grip of the operator and by the contact of the stationary clipper blade with the surface against which the clipper is operating. Where the operating conditions are such as to substantially overcome and damp out the vibration of the casing, the adjustment of the tuning of the system with relation to the impressed vibrations of the alternating current is in many instances so changed as to render the device inoperative.

It is therefore more specifically one object of the present invention to provide a clipper of the general type herein disclosed in which the tendency of the clipper casing to vibrate at the frequency impressed by the driving impulses of the alternating current is completely overcome under all operating conditions to maintain a stable adjustment of the natural period and amplitude of vibration of the moving parts.

It is another object of the present invention to provide a novel and improved clipper which will be quiet in operation as compared with clippers previously produced, and will be so arranged as to permit the wear on the parts through continued operation to be taken up without interfering with the quiet or efficient operation of the device.

With these objects in view, one feature of the invention consists in the provision of a dynamic vibration absorber which is arranged to offset the vibratory movement of the moving parts of the clipper, and thereby damp out the vibrations set up in the casing.

Another feature of the invention consists in the arrangement of the armature and movable blade and of the springs for controlling the operation of these parts to maintain at all times a quiet and efficient operation of the clipper.

The several features of the invention consists also in the devices, combinations, and arrangement of parts hereinafter described and claimed which, together with the advantages to be obtained thereby, will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawings, in which Fig. 1 is a plan view of the clipper with the cover removed; Fig. 2 is a side view taken substantially on the line 2—2 of Fig. 1; Fig. 3 is a detail sectional view taken substantially on the line 3—3 of Fig. 1, showing particularly the two clipper blades and certain of

their operating connections; Fig. 4 is a sectional view taken on line 4—4 of Fig. 1; Fig. 5 is a detail plan view of the dynamic vibration absorber; and Fig. 6 is a side view of the same.

The hair clipper disclosed in the drawings as embodying in a preferred form the several features of the present invention comprises a casing 8 which houses the operating parts of the clipper and also forms a handle which may be conveniently grasped by the hand of the operator. At the forward end of the casing, a fixed cutter blade 10 is secured by means of the clamping screws 12, as indicated in Fig. 2. Cooperating with the fixed blade 10 is a movable blade 14 which is arranged to move laterally of the fixed blade, being guided in this path by engagement of two bars or keys 16 in a corresponding slot 18 formed in the fixed blade 10. The bars 16 are secured to move with the movable blade 14 by means of screws 20.

The power for operating the clipper is supplied by means of an electromagnet to which driving impulses are imparted at a rapid frequency by an alternating electric current to secure a rapid vibratory movement of an armature 26 which is arranged to oscillate the movable blade 14. The current is applied to the electromagnet comprising a core 22, roughly U-shaped, and provided on one arm of the U with a winding 24, through electrical connections which include a cable 28 which enters the casing through a nut 30 provided for this purpose at the rear of the clipper, and a starting and stopping switch indicated generally at 32.

The armature 26 intermediate its length is mounted on a spring 34 which serves as a pivot about which the armature can swing. For convenience in construction, the armature is built up of two separate members which are riveted to the spring 34 and to each other, the rear member or armature proper comprising a flat bar arranged on edge to cooperate directly with poles of the electromagnet, and the forwardly extending tongue arranged in a flat or horizontal position shaped at its forward end to engage with a corresponding slot 38 in the movable blade 14. As will be noted from Fig. 1 of the drawings, the slot 38 is wider than the engaging portion of the tongue 36.

In order to provide a satisfactory operating connection between the clipper blade 14 which, as above pointed out, has a straight line movement with relation to the fixed blade 10 and the engaging portion of the tongue 36 of the armature which has an arcuate movement about its pivoting spring, one feature of the present invention contemplates an arrangement of the cutter return and tension springs and the adjusting spring for the vibrating armature and the movable blade, which will cause the tongue 36 to be held at all times in contact with one side of the slot 38. To this end, spring means are provided which tend to move the blade 14 and the armature tongue at all times in opposite directions, the relative strength of the springs being at the same time so adjusted with relation to each other and to the weight of the moving parts as to secure the required amplitude and natural period of vibration of the whole system with relation to the impressed period of vibration of the alternating current circuit. Acting directly on the movable blade 14 are two main cutter return and tension springs 40 which engage in recesses 42 in the upper surface of the blade and tend to hold it at the extreme limit of its movement in a direction opposed to the direction of the pull exerted by the electromagnet through the armature on the movable blade. These springs are secured to a block 44 which is in turn mounted on a flat spring member 46 secured by a nut 48 to the casing 8. The springs arranged in this manner are made to serve two separate functions, since they tend to hold the movable cutter blade at the limit of its movement in one direction, and at the same time exert a pressure on the upper face of the cutter blade 14 to hold the two blades in contact. The mounting of the cutter return and tension springs 40 and block 44 on the flat spring 46 has the effect of giving the springs a greater flexibility in a vertical direction to make possible a more accurate adjustment of the bearing pressure of the springs on the movable cutter blade 14 to establish the required frictional contact between the blades.

In order to provide an adjustment of the armature to regulate the air gap between the armature and the electromagnet, and also to provide means for holding the armature at all times in contact with a side of the slot 38, a compression spring 50 is seated in a hollow nut 52 screw-threaded into the side of the casing, and bears against the armature at a point adjacent to its pivotal connection with the spring 34 tending to move the armature toward the poles of the electromagnet against the action of the springs 40.

With this arrangement of the cutter return and tension springs 40 and the spring 50, a point of contact is maintained at all times between the movable blade and the armature which effectually prevents any undesirable play between the parts, with consequent noise or chatter in the connection, and further compensates automatically for wear on the bearing surfaces with continued use.

With the construction of the clipper herein disclosed in which the movable blade is arranged to reciprocate in a path determined by engagement of the keys 16 with the guideway 18, difficulty has been experienced in preventing undesirable back lash between the

keys and the guideway as the movable blade is propelled first in one direction and then in the other by the armature tongues 36 and the return springs 40. To overcome this difficulty, the tongue 36 of the armature and the return springs 40 are arranged to engage with the movable blade 14 at points on different planes parallel to the line of movement of the blade 14, so that the opposed forces of the return springs 40 and the armature tongue 36 will tend at all times to exert a twisting strain on the movable blade with relation to the guideway 18 to hold the upper or left hand key 16 as shown in Fig. 1 in contact with the rear side of the guideway and the lower or right hand key 16 in engagement with the rear side of the guideway.

In order to prevent any disarrangement of the coils of the spring 50 as the nut 52 is turned up or backed off to vary the load on the armature, the base end of the spring is bent inwardly and down to provide a centrally located pivot 54 which engages in a corresponding indentation in the nut, and permits the rotation of the nut without changing the positions of the coils of the spring. To assist in the tuning of the vibrating system which includes the springs above enumerated, the movable blade and the armature, with relation to the impressed impulses of the alternating current, a weight 55 is secured by means of a screw 56 to the forward end of the armature tongue 36.

In order to eliminate objectionable vibration of the clipper casing and to provide a clipper which will operate smoothly and evenly, a dynamic vibration absorber is provided which acts automatically to damp out any tendency of the clipper casing to vibrate caused by the vibratory movements of the armature and movable blade. This absorber unit comprises a spring member 60 formed integrally with a plate 62 which is rigidly secured by a screw 64 and pins 66 to the clipper casing. At its free end, the spring member 60 carries a weight 68 which is adjusted relatively to the strength of the spring 60 to impart to the vibration absorber a natural period of vibration which will be equal to the period of vibration set up in the casing by the moving parts of the clipper. The vibration of the casing will then tend to set up a corresponding vibration of the vibration absorber unit which will be 180° out of phase with the vibrations of the casing and of a corresponding intensity or amplitude to substantially damp out the vibrations of the casing.

In a clipper of the type herein disclosed which is operated by an alternating electric current, the rate of vibration of the moving parts of the clipper and the consequent rate of vibration set up in the casing is determined solely by the frequency of the driving impulses impressed on the armature by the alternating electric current, and is in no way dependent on the tuning of the natural period of vibration of the vibrating system. Since the frequency of the electric current remains constant and must therefore maintain constant the frequency of the vibratory movements of the armature and movable blade, the dynamic vibration absorber when once tuned to damp out corresponding vibrations set up in the casing at this frequency, will be effective to eliminate the vibration of the casing under all possible operating conditions. Changes in the amplitude of the vibrations which tend to be set up in the clipper casing, and any changes which may occur in the effective weight of the vibrating mass, due to alterations in the operating conditions under which the clipper is used, are automatically taken care of by the vibration absorber unit which tends to have a correspondingly greater or less amplitude of vibration to offset the force of the vibrations set up in the casing.

In clippers of the vibratory type, as heretofore constructed, in which no provision has been made for damping out the counter vibrations set up in the clipper casing, the adjustment of the amplitude and natural period of vibration of the vibratory system with relation to the period of vibration impressed on the armature and movable blade by the driving impulses of the alternating current is necessarily dependent to a considerable extent on the weight and tendency to vibrate of the clipper casing itself, since the characteristics of any vibratory system are dependent on the relative values of the strength of the springs and the weight or mass of the moving parts. Under these conditions, it will be evident that where for any reason during the operation of the clipper, the casing is partially or wholly prevented from vibrating, the strength of the springs will be substantially increased with relation to the mass of the moving parts, and will result in a material change in the tuning of the system and also in the amplitude of movement of the armature and movable blade.

It has been found by actual experience that the damping effects produced on the vibration of the clipper casing to a greater or less extent by the grip of the operator and by contact of the stationary blade with any stationary object will upset the adjustment and tuning of the natural period of vibration of the vibrating system with relation to the frequency impressed by the alternating current to such an extent as to result in the faulty operation of the clipper, and in some instances, even to render it entirely inoperative.

From the above discussion, it will be seen that the provision of means for damping out at all times the counter vibrations set up in the clipper casing by the vibratory movements of the armature and movable blade will have the effect of preventing any change in

the tuning of the system and the consequent faulty operation of the clipper, due to the tendency of other objects brought in contact with the casing during the operation to produce a damping effect on these vibrations to a greater or less degree. The introduction of the dynamic vibration absorber in the construction herein disclosed to eliminate these vibrations of the clipper casing therefore has an important advantage in preventing any change in the tuning of the system under the varying conditions of commercial use, and results in the production of a clipper which is more satisfactory and efficient in operation than any clipper previously produced.

While the several features of the invention have been herein disclosed in their preferred form in a hair clipper particularly adapted for tonsorial use, and is of the vibratory type in which the impulses impressed upon an electromagnet by an alternating current are utilized to impart a rapid vibratory movement to a tuned vibratory system including a movable blade and armature and tuning springs, it will be understood that certain features of the invention are not to be limited to this specific type of clipper, but may be equally applicable to clippers of other types and for different uses.

Having thus described the invention, what is claimed is:

1. In a clipper, the combination with a casing, of a stationary clipper blade carried by the casing, a movable clipper blade cooperating with the stationary blade, means carried by the casing for imparting vibratory movements to the movable blade, and a dynamic vibration absorber actuated only by vibrations tending to be set up in the casing and comprising a weighted spring member having a natural period of oscillation corresponding to that impressed on the clipper by the vibratory movements of the movable blade and said actuating means and rigidly secured to the casing at a point to substantially eliminate said vibrations.

2. In a clipper, the combination with a casing, of a stationary clipper blade carried by the casing, a movable clipper blade cooperating with the stationary blade, means carried by the casing for imparting vibratory movements to the movable blade, and a dynamic vibration absorber actuated only by vibrations tending to be set up in the casing and comprising a weighted spring member rigidly secured to the casing and tuned to the period of vibration set up in the casing by the operation of the clipper.

3. In a clipper, the combination with a casing shaped to be grasped by the hand of an operator, of a blade carried by the casing, a movable blade cooperating with the stationary blade, means carried by the casing for imparting vibratory movements to the movable blade at a substantially constant rate, and a dynamic vibration absorber actuated only by vibrations tending to be set up in the casing and comprising a weighted spring member rigidly secured to the casing tuned to the frequency of the vibration set up in the casing by the operation of the clipper and arranged to permit a variation in the amplitude of oscillation of said spring member to offset and thereby to eliminate said vibrations as modified by contact of the clipper with external objects.

4. In a clipper, the combination with a casing, of a stationary clipper blade carried by the casing, a movable clipper blade cooperating therewith, an electromagnet, an armature connected to the movable blade and having a movement toward and away from the poles of the magnet, and a dynamic vibration absorber actuated only by vibrations tending to be set up in the casing and comprising a weighted spring member having a natural period of oscillation corresponding to that impressed on said movable blade and rigidly secured to the casing at a point to eliminate vibration of the casing.

5. In a clipper, the combination with a casing, of a stationary clipper blade carried by the casing, a movable clipper blade cooperating therewith, an electromagnet, an armature connected to the movable blade and having a movement toward and away from the poles of the magnet, spring means tending to move the armature away from the poles of the magnet, and a dynamic vibration absorber actuated only by vibrations tending to be set up in the casing and comprising a weighted spring member rigidly secured to the casing tuned to vibrate when rendered operative by vibrations set up in the casing 180° out of phase with the vibrations of the armature impressed thereon by the pulsations of the actuating current and thereby to substantially damp out said vibrations which tend to be set up in the casing.

6. In a clipper, the combination with a casing, of a movable blade, a blade cooperating therewith, an electromagnet, an armature connected to the movable blade and mounted for movement toward and away from the poles of the magnet to oscillate the movable blade, a spring member engaging with the movable blade to resist the pull of the electromagnet and to tension the blades, a block to which said spring member is secured, and a flat spring carrying said block and fastened to the casing arranged to provide a substantially increased resiliency of the spring system to hold the blades in contact without substantially altering the strength of the spring member exerted laterally to resist the pull of the electromagnet.

7. In a clipper, the combination with a casing, of a movable blade, a blade cooperating therewith, an electromagnet, an armature connected to the movable blade and

mounted for movement toward and away from the poles of the magnet to oscillate the movable blade, a pair of spring fingers engaging with the movable blade to resist the pull of the electromagnet and to tension the blades, a block to which said fingers are secured, and a yielding support for said block comprising a flat spring disposed in the clipper casing in a plane parallel to the line of movement of the movable blade, and secured at its forward end to the casing and at its rear end to the block.

8. In a clipper, the combination with a casing, of a movable blade, a blade cooperating therewith, an electromagnet, an armature connected to the movable blade and mounted for movement toward and away from the poles of the magnet to oscillate the movable blade, a spring member engaging with the movable blade to resist the pull of the electromagnet and to tension the blades, and a yielding support for said spring member comprising a flat spring disposed in the clipper casing in a plane parallel to the line of movement of the movable blade and secured at its forward end to the casing and at its rear end to the rear end of the spring member.

9. In a clipper, the combination with a casing, of a stationary clipper blade carried by the casing, a movable clipper blade cooperating with the stationary blade, a guideway for controlling the direction of movement of the movable blade with relation to the stationary blade, an electromagnet, an armature having a movement toward and away from the poles of the magnet and arranged for engaging contact with the movable blade, a spring engaging the armature tending to move the armature and movable blade contacting therewith in the direction of pull of the electromagnet, and a spring member engaging the movable blade tending at all times to force the blade and the armature having engaging contact therewith toward the limit of their movement in an opposite direction against the pressure of the armature spring, the points of engaging contact of the return spring and the armature with the movable blade being arranged to lie in different planes parallel to the line of movement of the movable blade.

10. In a clipper, the combination with a casing, of a stationary clipper blade carried by the casing, a movable clipper blade cooperating with the stationary blade, a guideway for controlling the direction of movement of the movable blade with relation to the stationary blade, an electromagnet, an armature having a movement toward and away from the poles of the magnet and arranged for engaging contact with the movable blade, a spring engaging the armature tending to move the armature and movable blade contacting therewith in the direction of pull of the electromagnet, and a spring member engaging the movable blade tending at all times to force the blade and the armature toward the limit of their movements in a direction contrary to the pull of the electromagnet, the parts being arranged to cause the opposed forces of the armature spring and return spring to exert a twisting strain on the movable blade with relation to the guideway at all times in one direction.

11. In a clipper, the combination with a casing, of a stationary clipper blade carried by the casing, a movable clipper blade cooperating therewith, an abutment on the movable blade, an electro-magnet, an armature having a movement toward and away from the poles of the magnet and arranged to engage an abutment on the movable clipper blade, a spring engaging the armature tending to move the armature toward the poles of the magnet, and spring means mounted on the casing and engaging the movable blade to force said blade and armature engaging said abutment to the limit of their movement in an opposite direction against the pressure of the armature spring to maintain the movable blade and abutment thereon continuously in engaging contact with the armature.

12. In a clipper, the combination with a casing, of a stationary clipper blade carried by the casing, a movable clipper blade cooperating therewith, an abutment on the movable blade, an electro-magnet, an armature having a movement toward and away from the poles of the magnet and arranged to engage the abutment on the movable clipper blade, a spring engaging the armature tending to move the armature toward the poles of the magnet, and a unitary spring member mounted on the casing and engaging the movable blade to tension the blades and tending to force said movable blade and the armature having engaging contact with said abutment to the limit of their movement in an opposite direction against the pressure of the armature spring to maintain the said blade and abutment mounted thereon continuously in engaging contact with the armature.

In testimony whereof I have signed my name to this specification.

IRVING O. MINER.